

Cl. S. H.



Profitable
Cultivation
of the
Sugar Beet

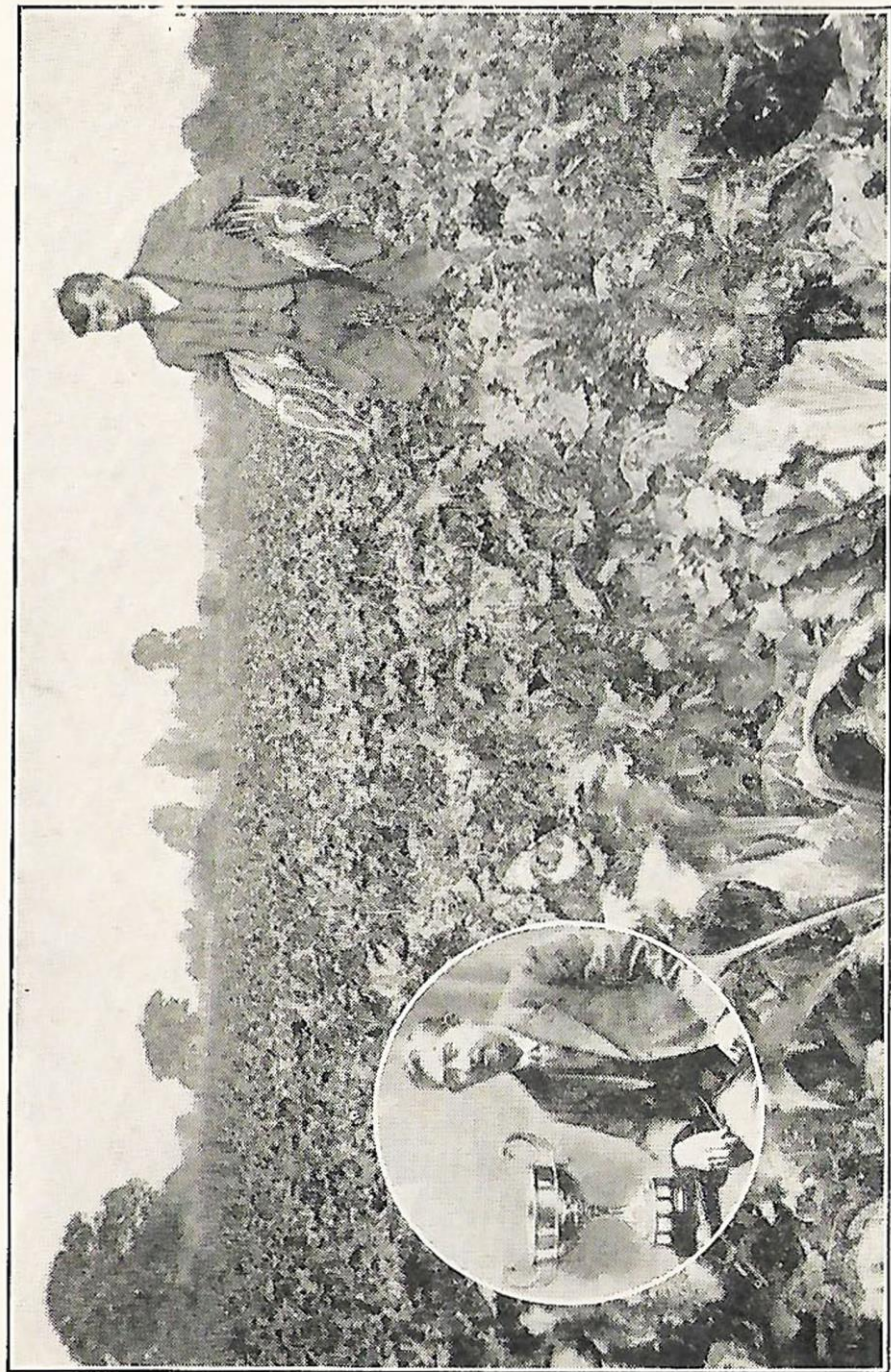
80th Thousand
Revised Edition
1929

PROFITABLE CULTIVATION
OF THE
SUGAR BEET.

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(5,000.)

The Winning Crop of Sugar Beet which won the "Mason Challenge Cup" for 1927, was grown by H. H. HARRIS, Esq., Besford, Worcester, with a crop of **16 ton of Washed Beets per acre and 18.7 per cent. Sugar.**



Mr. HARRIS attributes this wonderful success to the use of **3 cwt. of Chilean Nitrate of Soda** per acre.
(Inset Mr. HARRIS with cup).

The following Pamphlets may be obtained gratis and post free from

**THE CHILEAN NITRATE COMMITTEE,
FRIARS HOUSE,
NEW BROAD STREET,
LONDON, E.C. 2.**

FARMING.

Farmer's Handbook on the Use of Chilean Nitrate of Soda (Cereals, Hay, Roots, &c.).

Catch Crops and Forage Crops.

The Improvement of Pastures and Meadows.

Profitable Cultivation of the Sugar Beet.

The Manuring of Hops.

Nitrogen: Its Forms and Effects.

Crop Yields.—How the Farmer can test them on his own land.

Manuring Tables for Farm Crops.

MARKET GARDENING.

The Manuring of Market Garden Crops.

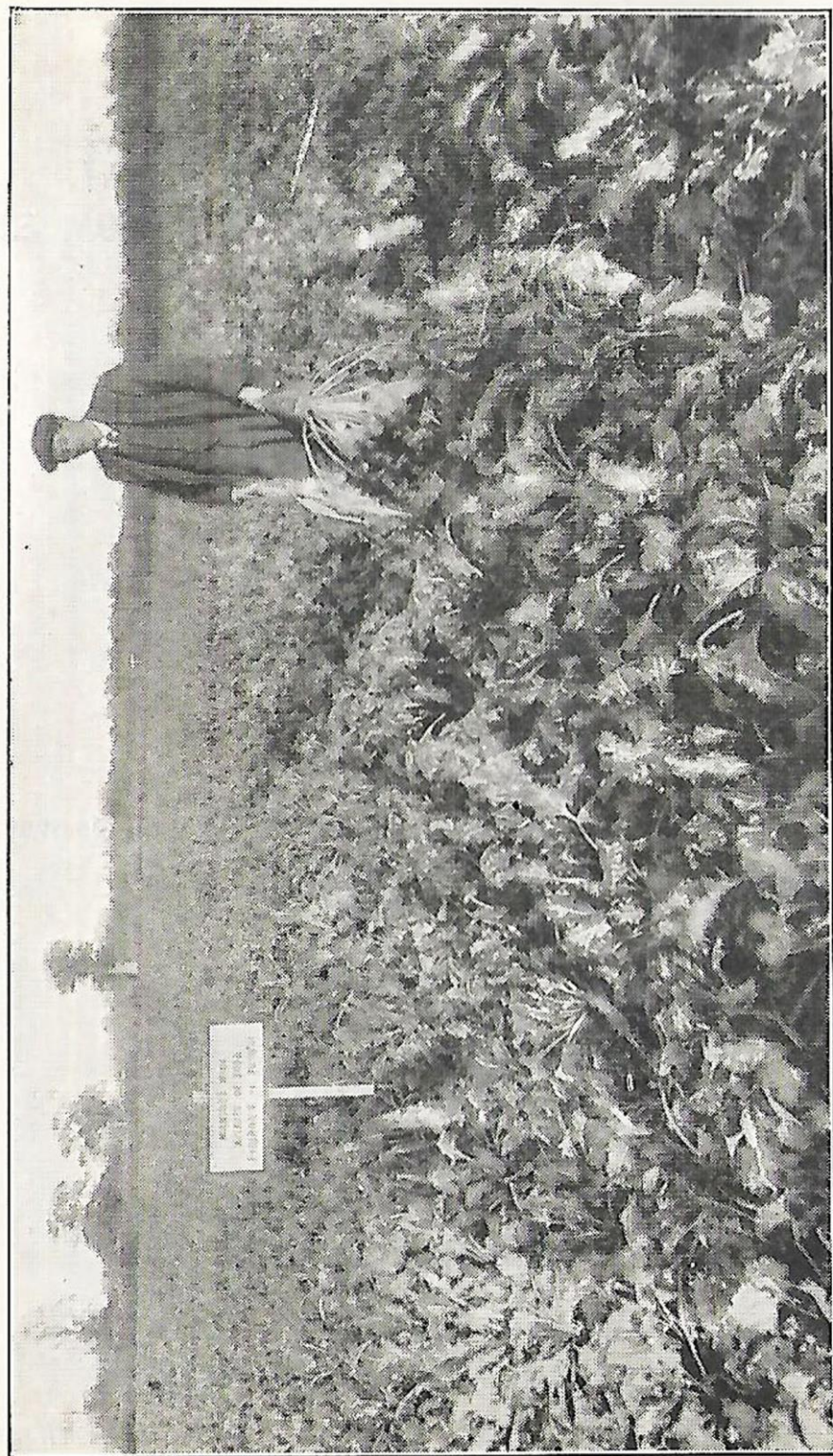
The Manuring of Orchards and Fruit Trees.

GARDENING.

Successful Gardens for Every Amateur.

The Chilean Nitrate Committee does not sell Chilean Nitrate of Soda, but information as to where it can be obtained in large or small quantities will be forwarded on application.

Record weight of Sugar per acre. Crop grown by H. H. HARRIS, Esq.,
New House Farm, Besford, near Worcester, in 1925. Variety—Kuhn.



Manures per acre : 2 cwt. Nitrate of Soda, 4 cwt. Superphosphate (14 per cent.) and 2 cwt. Sulphate of Potash.

Crop—18 ton 15 cwt. Washed Beet and 19 per cent. Sugar—yielding 3 ton 11 cwt. 0 qrs. 22 lb. per acre.

PROFITABLE CULTIVATION OF THE SUGAR BEET.

Sugar Beet.—The plant known to us as the sugar beet was known to the ancient Romans as the “white beet,” the root being used by them both for human and animal consumption, the young leaves were also consumed as a vegetable and the tops used as forage for stock.

The root should be grown entirely below the ground, it thus resembles somewhat in shape and colour the parsnip, as it has a long tapering root, but it is larger and broader at the top.

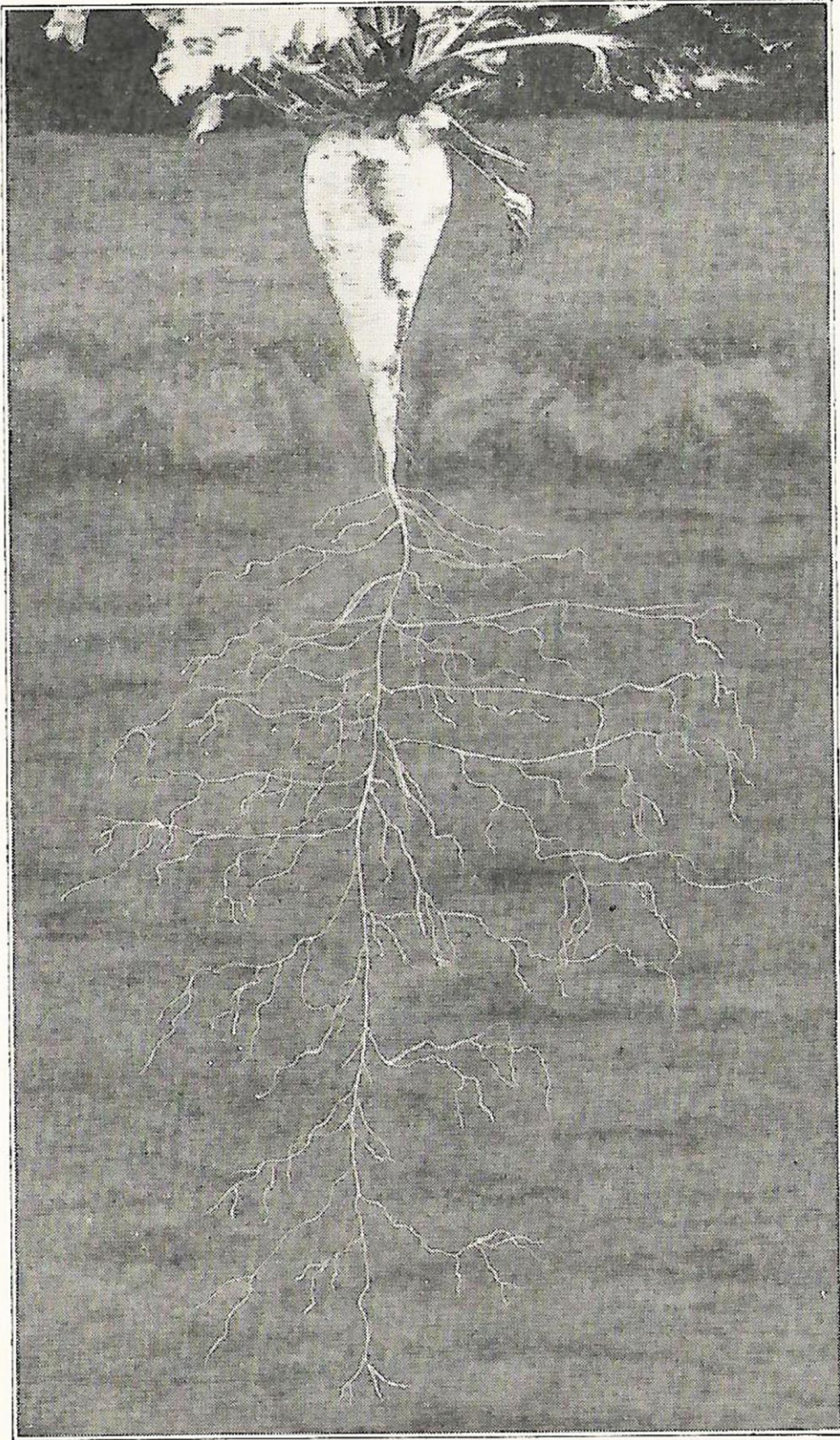
The commercial seed used in sugar beet cultivation is grown from “mother seed,” which is propagated from year to year, and the varieties have been much improved by selection and scrutiny. When originally cultivated the roots contained only about 6 per cent. of sugar, but by continual selection over many years the plant has now been so improved that it produces and stores in the root from 15 per cent. to 21 per cent. of its net weight of sugar.

The introduction of sugar beet culture into the farm rotation has determined the progress of all the other branches of agriculture in those countries where it has become established. It has been truly said that the culture of the sugar beet crop has been the finest school for rational agriculture. This plant requires large amounts of fertilisers which are not entirely consumed by the crop, and the residues are thus available for the succeeding crop of the rotation. The careful labour required for its successful growth cleans and mellows the soil and, in addition, the sugar beet crop produces large quantities of foodstuffs for

the farm stock. These advantages of the crop may be said to be acquired almost gratuitously because the sale of the roots produces in hard cash a profit over and above all the cost of growing the crop. Thus it is a valuable cleaning crop, which is purchased by the beet sugar factory for cash, and its cultivation not only improves, but it enriches the soil, for only about one-third of the nitrogen in a beet crop is taken away with the roots, while two-thirds are left in the field in the crowns and tops, and by ploughing these under while green, much valuable humus is added, and about two-thirds of the nitrogen, phosphoric acid and potash required to produce the original crop are returned to the soil.

A well-grown sugar beet has a straight tap root which penetrates to a great depth in the soil, and far beyond that reached by the plough. It is this length of root which enables the crop to withstand drought so successfully after it has once passed its first stage of growth. The roots attain a length of 18 inches to 3 feet; thus they open the soil, facilitate the penetration of water and utilize the plant food from the lower layers of the soil (*see page 7*). This characteristic therefore plays a large part in the improvement of the soil.

The increased fertility of land after it has been under sugar beet is clearly shown by the agricultural statistics of Belgium and Germany. Figures have been published concerning the crops grown in Belgium in those areas where sugar beet is cultivated, which show that since the year 1846 until the present time, the acreage devoted to sugar beet has steadily risen, while at the same time the yields of wheat and oats per acre has nearly doubled, and the number of cattle maintained per acre has increased by 50 per cent.



ILLUSTRATING ROOT SYSTEM OF SUGAR BEETS and
GREAT FEEDING AREA.

In Germany it is generally admitted that sugar beet has been of immense service to agriculture, and that the intense and intelligent cultivation required proved everywhere an advantage for the other branches of agriculture.

Perhaps the most striking illustration of the benefit of the sugar beet crop is shown by the large increase in the value of the agricultural land during the last 40 years in those districts where sugar beet is grown, while in the non-beet districts the value has remained comparatively stationary.

Climate and Soil.—There can be no question that our climate is just as well suited as the rest of Europe to its remunerative cultivation, and also to the production of beets which compare most favourably in sugar content with those grown in the chief beet-growing districts on the Continent.

The best soils are medium and light loams, well supplied with lime, sufficient organic matter and comparatively free from stones. The type of soil suitable for sugar beet is by no means a restricted one, and any moderately useful agricultural land appears to be suited for the cultivation of this crop. Heavy clay soils are the least adapted to the growth of the sugar beet, as difficulty is experienced in raising the crop in good order and free from soil. Proper drainage and aeration are essential factors. Water-logged soils grow sugar beet with branching or "fangy" roots.

Rotation.—Recent conditions have considerably modified the view of agriculturists on the question of the rotation of crops. At the present time, the decision as to what crops shall be grown is dominated by the varying economic conditions, or, in other words, by the price of the produce. The farmers are departing from the rigid course

of rotation which they have hitherto invariably adhered to, as they think primarily of the financial result of their undertaking, and thus prefer an independent rotation. Certain rules should, however, be taken into consideration.

Like other roots, beet follows a grain crop, and there is no hard and fast rule for the place of sugar beet in the rotation. It should not, however, be grown immediately after clover or newly ploughed up land, as in such a case it would be frequently exposed to the attacks of insect pests and fungoid diseases and thus give a very poor yield of sugar. The following suggested rotations may be altered to meet the varied requirements of each farm :—

(1) FOUR COURSE. (2) SIX COURSE.

Sugar beet.	Sugar beet.
Barley or oats.	Barley or oats.
Clover.	Sugar beet.
Wheat.	Barley.
	Clover.
	Wheat.

While sugar beet is usually followed by a cereal which does not require any additional fertiliser, in Belgium an endeavour is always made to sow wheat after the lifting, because wheat prefers such fertile ground. But this is sometimes impossible and oats are substituted when unseasonable weather stops carting or prevents the wheat sowing.

Manuring.—To fully appreciate the requirements of the plant, it should be understood that the function of the leaf is to manufacture the sugar from the carbon dioxide in the air, with the aid of diffused sunlight (not necessarily direct sunshine). The function of the root being to store the sugar. It therefore follows that the grower has to aim

at producing a plant having a healthy, but not super-abundant top, and a bulb capable of assimilating the sugar manufactured by that top. We have then to deal with a complicated plant the relation of top and root being that of factory and warehouse.

The grower, being paid by the factory for sugar, must produce the highest possible tonnage per acre of good quality roots. For this reason careful attention should be paid to the scheme of manuring, the time and mode of application. The time of application of Chilean Nitrate of Soda particularly being extremely important.

Lime.—The majority of crop failures with sugar beet can be attributed to acidity of the soil, and to ensure the best results from the other fertilisers applied, this fact cannot be disregarded. It is useless to attempt to grow this crop in soil obviously short of lime, as, though the plants may come, they tend to die out rapidly, and any roots that develop are apt to become forked or fangy.

On soils short of lime, a dressing of 10 to 15 cwt. of ground lime (oxide of lime) or 20 to 30 cwt. of ground limestone or chalk (carbonate of lime) may be harrowed in a few weeks before the seed is sown, but preferably in the autumn, a month after ploughing in the dung.

Sugar Beet Waste Lime.—This is a waste carbonate by-product obtained during the process of the manufacture of sugar in the factories, and about half its weight is made up of water. If put into a heap in the field where it is required, it will dry out and “fall,” and is very useful as a substitute for lime to growers near a factory.

Dung.—The application of dung must not be overdone, and 10 to 12 tons per acre are sufficient.

Demonstration on Sugar Beet, by J. G. WHITTLES, Esq., Sherlowe, Wellington, Salop.

Previous Crop—Potatoes, manured with Dung and complete Fertilisers. Soil—Medium Loam on sand.

2 ton of Ground Limestone per acre applied in autumn.



7 cwt. Chemical Guano.
Crop, 9 ton 14½ cwt. Washed Beet.
Weight of Sugar, 1 ton 11½ cwt. per acre.

7 cwt. Chemical Guano and 3 cwt. NITRATE OF SODA.
Crop, 15 ton 14 cwt. Washed Beet.
Weight of Sugar, 2 ton 17 cwt. per acre.

Net Gain due to the use of 3 cwt. Nitrate of Soda £18. 11s. per acre.

Sugar beet does not like excess of organic matter in any form, and if such is present, not only will there be an over-abundance of top or leaves, but the root will probably be small, stunted and fangy, and yield a lower percentage of sugar.

The most successful crops are grown where the dung has been applied to the previous crop, but when this is not possible the dung should be spread on the stubble in autumn and ploughed in. In no circumstances should it be applied later than February. It is important that only well-rotted dung be employed, as fresh dung harms the tap root and causes forking, the ripening being retarded and the percentage of sugar lowered.

The effect of an application of dung is to loosen the soil, while the development of carbonic acid, during the formation of humus from it, brings about many useful changes; furthermore, in a dry year the beets root much more easily in a field dressed with dung. Heavy yields can be grown with artificials alone, but this is not advocated except when dung is not available or in places where the expense of carting it would be too great, as, for instance, to a high-lying field. **Least of all should a dressing of dung be omitted on soils of a dry or sandy nature, for on these it acts as a safeguard against a drouthy spring, short or well rotted dung always being used.** The sugar beet plant passes through a very precarious stage of existence between germination of the seed and the time of singling, and during this period a dressing of dung aids the retention of moisture in the soil.

Phosphates.—It is generally considered that phosphoric acid is best supplied to the sugar beet in the form of superphosphate, but on soils lacking in lime it is a good practice to apply the phosphate as basic slag or ground

mineral phosphate in the winter or early spring. Phosphates are necessary to get sugar beet of high quality, but have little influence on the yield per acre. An excess of phosphates harms the beets as it induces premature ripening—the leaves turn yellow and die off before the plant has had time to finish making sugar, and thus the final yield and percentage of sugar is lowered.

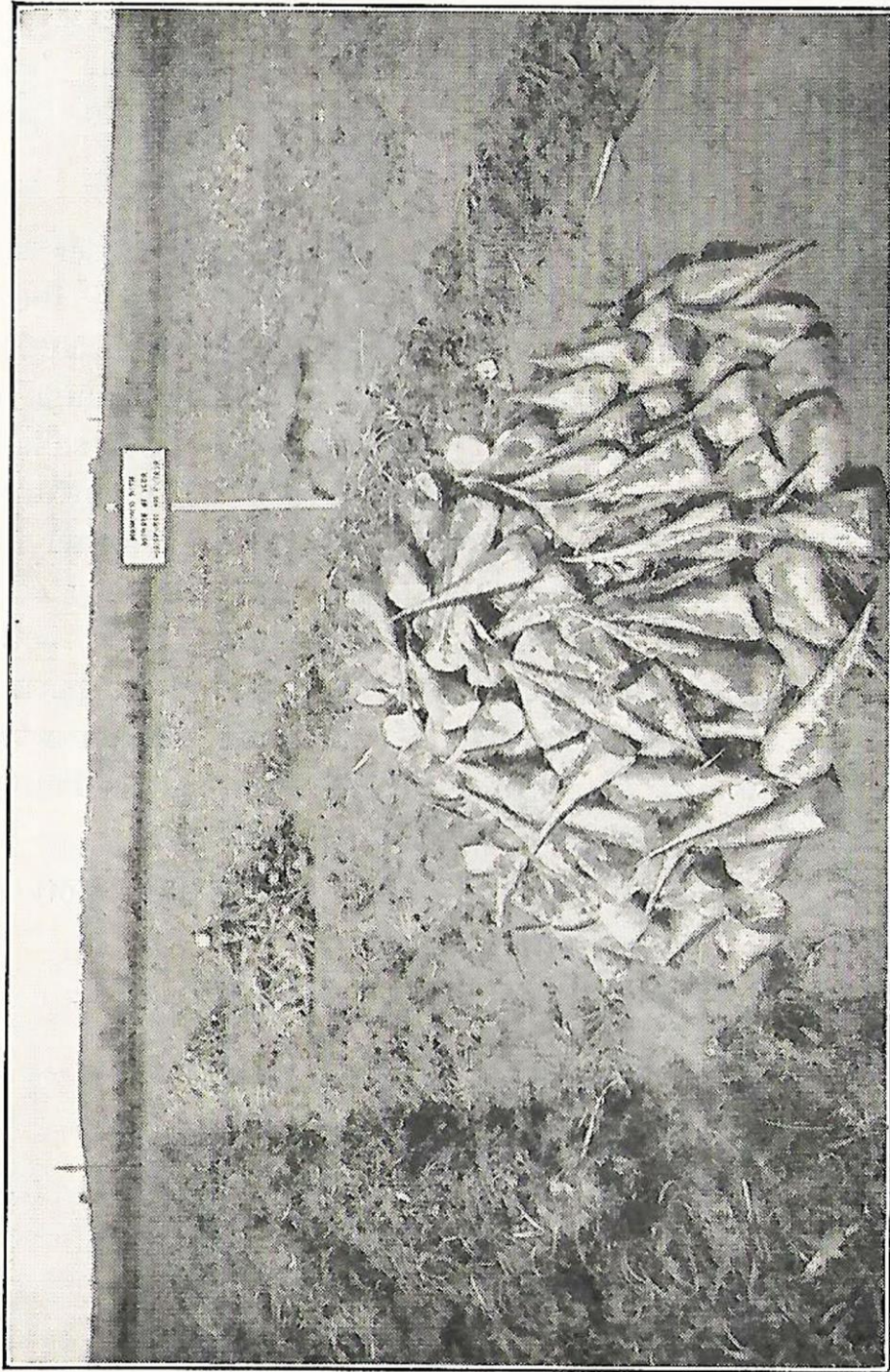
Potash.—Potash is a most necessary fertiliser for sugar beet, which responds well to this plant food, particularly on light soils. It should always be included in any manurial scheme, even for strong land, though it is the light, sandy, gravelly soils—typically beet soils—which are most in need of potash. It is of importance for the development of leaf and root alike, the former for providing the sugar and in the latter the necessary cells for the storage of the sugar. Potash may be directly applied by means of kainit, potash salts, sulphate of potash or muriate of potash. The two latter are concentrated and contain about four times as much potash as kainit. The equivalent quantities of potash manures are :—

3½ cwt. kainit (containing 14½ per cent. potash)
is equal to—

2½ cwt. Potash Salts	„	20	„	„
1⅔ „ „	„	30	„	„
1 „ Muriate of Potash	„	50	„	„
1 „ Sulphate of Potash	„	50	„	„

The choice of which to use will depend on circumstances, but as a rough guide sulphate of potash is preferable for heavy soils; muriate of potash for medium soils and kainit for light soils; where kainit and potash salts are used as a source of potash they should be applied broadcast about a month at least before the seed is sown, or better applied in the autumn, if possible.

Crop of Sugar Beet grown by Messrs. BRINTONS, Ltd., Oldington, Kidderminster.



Manures per acre—2 cwt. NITRATE OF SODA, Phosphate and Potash.

Photograph showing the Chilean Nitrate Committee's Demonstration Plots, lifted third week in September, 1926.
Official Analysis **23.2 per cent.** Sugar.

Nitrate of Soda.—Sugar beet requires a large amount of nitrogen to perfect its growth and it is undoubted that the nitrogen in nitrate of soda is the most advantageous to the sugar beet crop, and that this fertiliser gives better results than any of the other forms of nitrogenous manure. Comparative experiments have been carried out for many years on the Continent of Europe and in this country, and in all trials nitrate of soda has proved to be the best. The value of nitrate of soda as a manure depends chiefly upon its nitrogen, but the soda with which the nitrogen is combined has an indirect manurial value, by virtue of its action in liberating hitherto inactive potash in soils and bringing it into service for plant food.

The specific action of nitrate of soda is to stimulate a healthy growth of foliage and a strong root development. This it is able to do as it is soluble in water and spreads through the soil and subsoil, thus coming within reach of the absorbent root hairs. The yield of roots per acre is dependent, upon the presence of nitrogen in a readily available form.

The time of application is, therefore, all important, if the maximum benefit is to be obtained from the use of Chilean Nitrate of Soda. From observation and practical demonstrations in this country, it has been found that the best results are assured by applying at least two-thirds of the quantity to be used on the day of, or a few days before drilling the seed, and the remainder as soon as possible after the seedlings have attained the fourth leaf stage of growth. By sowing nitrate of soda at the time of seeding the plants are ready for thinning much earlier and the crop grows more vigorously and produces heavier yields.

The quantity recommended, which has produced the best average tonnage per acre over a period of years, is at least 2 or $2\frac{1}{2}$ cwt. with the seed followed by a top dressing of 1 to $1\frac{1}{2}$ cwt. per acre at the time indicated above. These applications may be profitably increased to a total of 6 cwt. per acre where the dressing of dung has been either light or omitted. It is of great importance that these quantities should be balanced by suitable quantities of phosphates and potash.

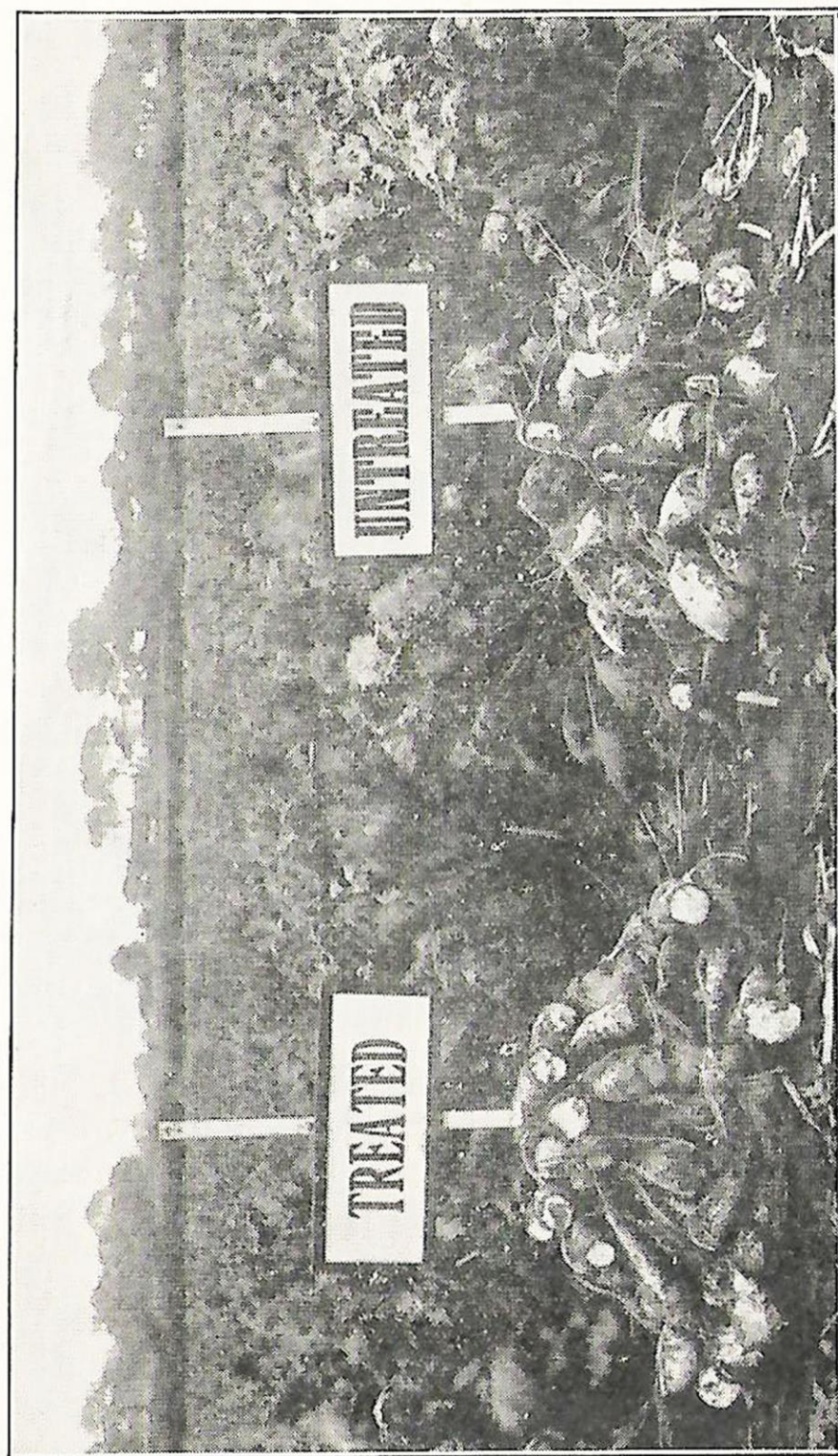
By the application of a heavy dressing at the time of drilling, nitrogen is readily available immediately the seed chits, this acts as a tonic, and from its earliest stage the plant is in a condition to make full use of the other available manures. Furthermore, these early applied manures penetrate the soil and thereby encourage deep rooting, as the plant follows them in search of nourishment.

It is not easy to say to what extent nitrate might be applied to the crop. On the whole the heaviest amount can be used on light sandy soil, *i.e.*, one in every respect suitable for the cultivation of beet, while smaller applications must be used on fen and peaty soils. Where, however, heavy doses of nitrate of soda are used, phosphates and potash must also be applied in proportion.

The statement has sometimes been made that the larger the dressing of nitrate used, the smaller will be the percentage of sugar in the roots. This contention, however, has been repeatedly disproved, assuming that the manure had been properly applied early.

The percentage of sugar is dependent upon several factors, as for instance the dryness of the soil. In a dry year, sugar percentage will be particularly high. Early weeding of the crop will increase the sugar content, and further, the preceding crop has great influence. Beet grown

Demonstration on Sugar Beet by Messrs. BENNETT & NICHOLSON, Hambleton, Poulton, Lancashire.
Previous Crop—Oats. Soil—Medium Loam on Sand.



4 cwt. Bones, 4 cwt. Kainit and 2 cwt. NITRATE OF SODA.
Crop, 17 ton 1 cwt. Washed Beet.
Weight of Sugar, 2 ton 15½ cwt. per acre.

4 cwt. Bones and 4 cwt. Kainit.
Crop, 13 ton 13 cwt. Washed Beet.
Weight of Sugar, 2 ton 6¼ cwt. per acre.

Net Gain due to the use of 2 cwt. Nitrate of Soda £8 per acre.

after wheat or other cereal will prove rich in sugar, while should it follow clover, or the land have been green manured, the roots will be slow to mature, and possibly be harvested unripe, and thus have a low sugar content.

Manurial Dressings for Sugar Beet.—It is not possible to set out a standard dressing that will be equally suitable, or economic, for all types of soils, but the following will be a guide that will enable the grower to choose a suitable mixture which can be adjusted as required.

SUGGESTED Manurings for Sugar Beet per acre.

Manures.	Heavy.	Medium.	Light.	Fen and Peat.	Remarks.
Farmyard manure ...	10 tons	10 tons	10-12 tons	Nil	Ploughed under in autumn.
Sulphate of potash or muriate of potash (or equivalent) ...	$\frac{1}{2}$ -1 cwt.	1 cwt.	1-1 $\frac{1}{2}$ cwt.	$\frac{1}{2}$ -1 cwt.	When preparing seed bed.
Super. or basic slag (14 per cent.) ...	4-5 cwt.	3-4 cwt.	3-4 cwt.	5-6 cwt.	
Chilean Nitrate of Soda ...	3 cwt.	3 cwt.	4 cwt.	1-2 cwt.	2 cwt. per acre when preparing seed bed. 1-2 cwt. per acre immediately after singling.

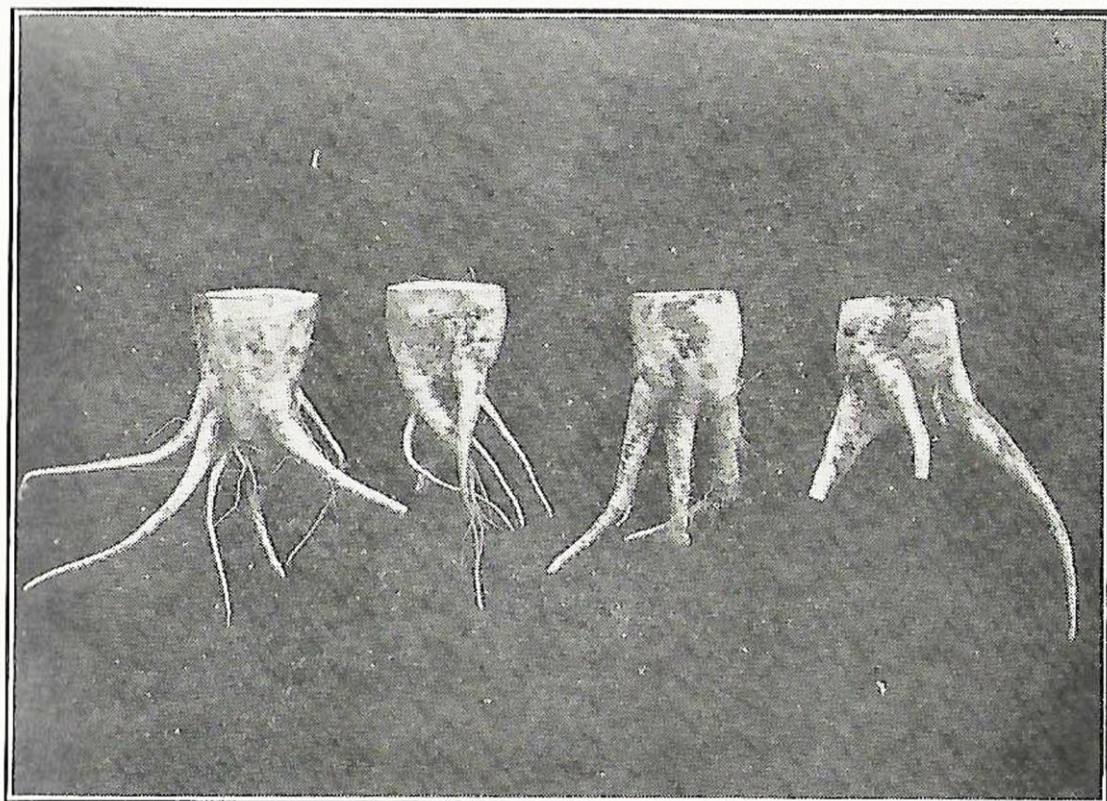
In the case where a dressing of dung was applied to the preceding crop, the above dressings of artificials, especially the nitrogen and potash, should be increased according to the condition and nature of the soil (the fen and peat soils excepted).

When shoddy is used instead of dung, larger quantities of phosphates and potash should be used.

Give 1 to 2 cwt. of Chilean Nitrate of Soda per acre at the time of drilling, and a top dressing in addition when

compound sugar beet fertiliser is used. If the latter already contains the quantity of available nitrogen recommended on page 18, then only the top dressing will be required.

Cultivation.—The preparation of the land for this crop must be carried out in such a manner as to result in the production of a deep mellow tilth. As deep cultivation

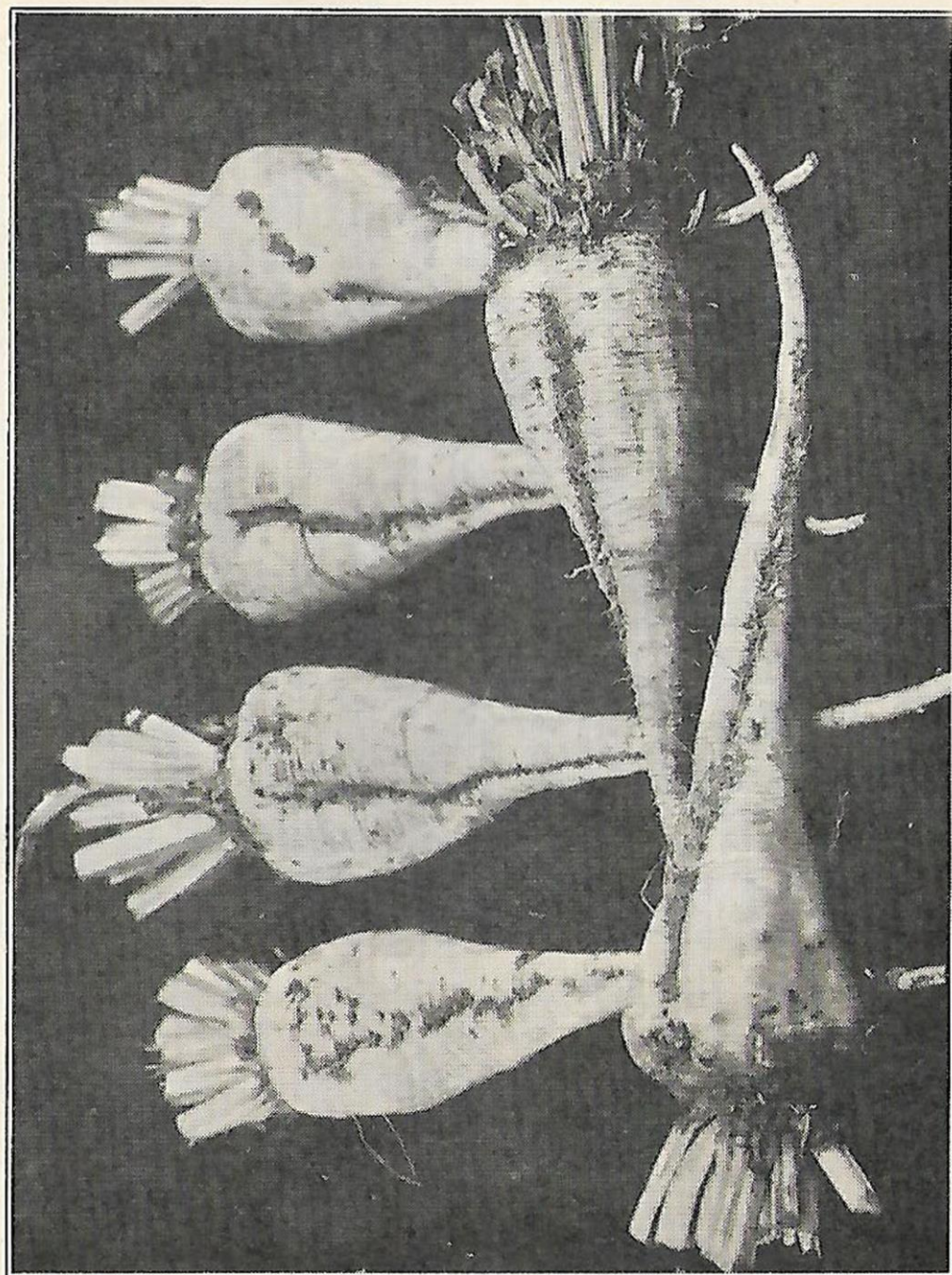


FANGY ROOTS DUE TO BAD CULTIVATION, LATE APPLICATION OF DUNG, &c.

is essential, the ploughing should be as deep as possible without bringing up the subsoil. A hard plough pan is fatal to sugar beet, as it leads to fangy roots (*see* page 25). Subsoiling is, therefore, advisable wherever necessary, as it provides a greater range for the plant roots, and also permits the growth of the long straight tap root.

If the autumn stubble is at all foul it should be skim-ploughed, or cultivated and thoroughly cleaned. The

A fine Sample of Sugar Beet grown by Messrs. RITCHIE BROS., Blackstone, Bewdley,
Worcestershire, with Nitrate of Soda.



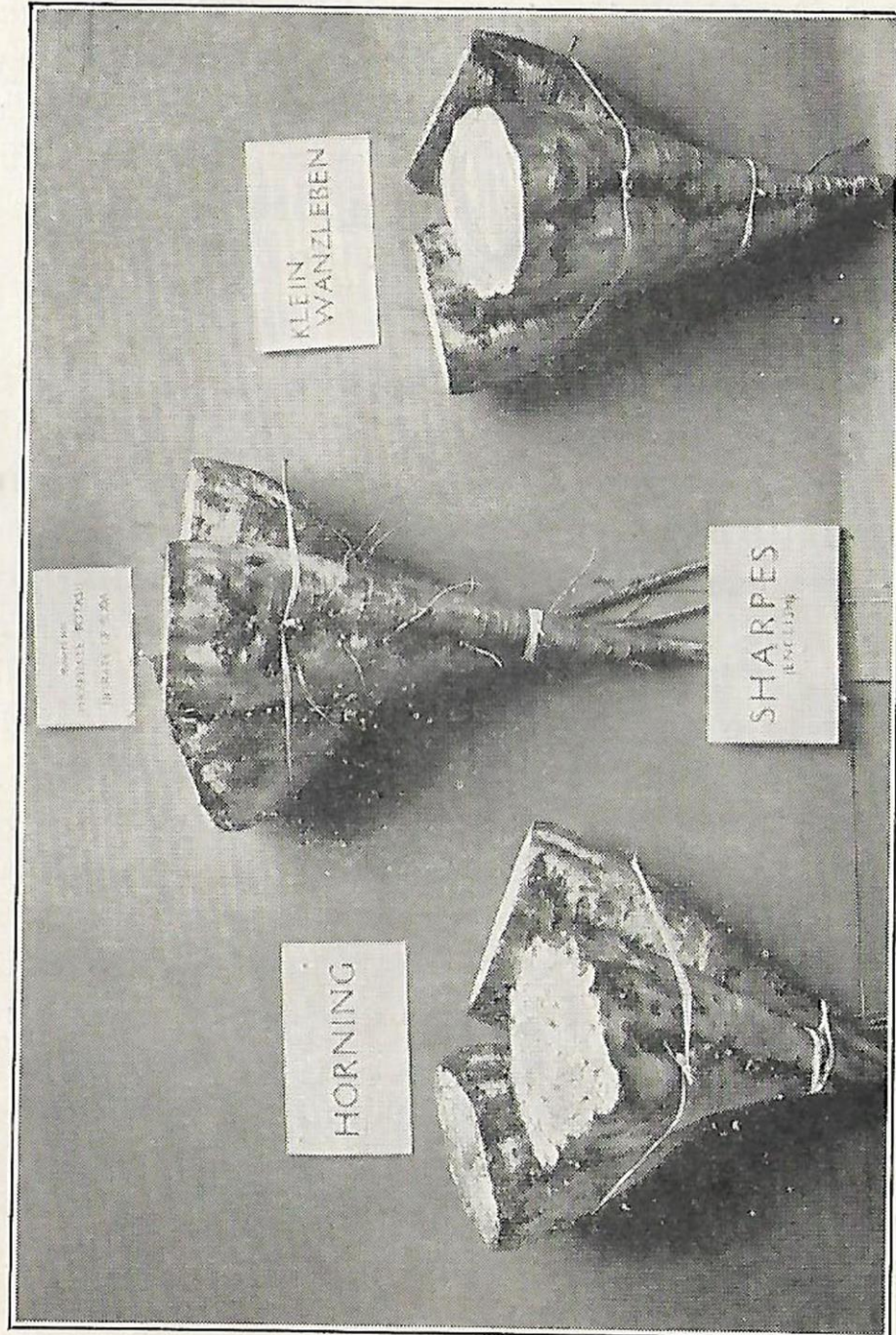
dung can then be carted on and ploughed in deeply, and it is a great advantage to have a subsoil attachment fixed to the plough as well. In spring the land is broken up by cultivator and harrows to the depth of the winter furrow. If the land is cloddy the Cambridge roll should be run over it. The final cultivations at the time of drilling must be regulated by the dryness and tilth of the soil, and the probabilities of rain. It must constantly be borne in mind that a fine deep tilth and **firm seed bed are essential and no labour must be spared to obtain it.**

Seed and Sowing.—Seed is always supplied by the factory to the growers at cost price, and only beets grown from this seed are accepted. By this means the factory ensures receiving only roots grown from pedigree seed which alone will provide a crop of high sugar content. The seed may be drilled from April to the middle of May. It is difficult to recommend any definite date in order to obtain the best results, but the seed should never be drilled unless there is a fine firm seed bed and the climatic conditions are suitable. Early drilling ensures an early harvest and a higher sugar content in October, but early drilled seed does not germinate so quickly, and is liable in a cold spring to germinate poorly. Late drilling gives a later harvest, but a quicker and a more reliable germination. If a large area is being grown it is advisable to drill at three different times at intervals of 10 days, as the beets will not require singling or hoeing at the same time, and as the different seedings will not ripen all together harvesting and delivery to the factory can be regulated accordingly.

The seed should be sown on the flat, or on the ridge, according to local custom.

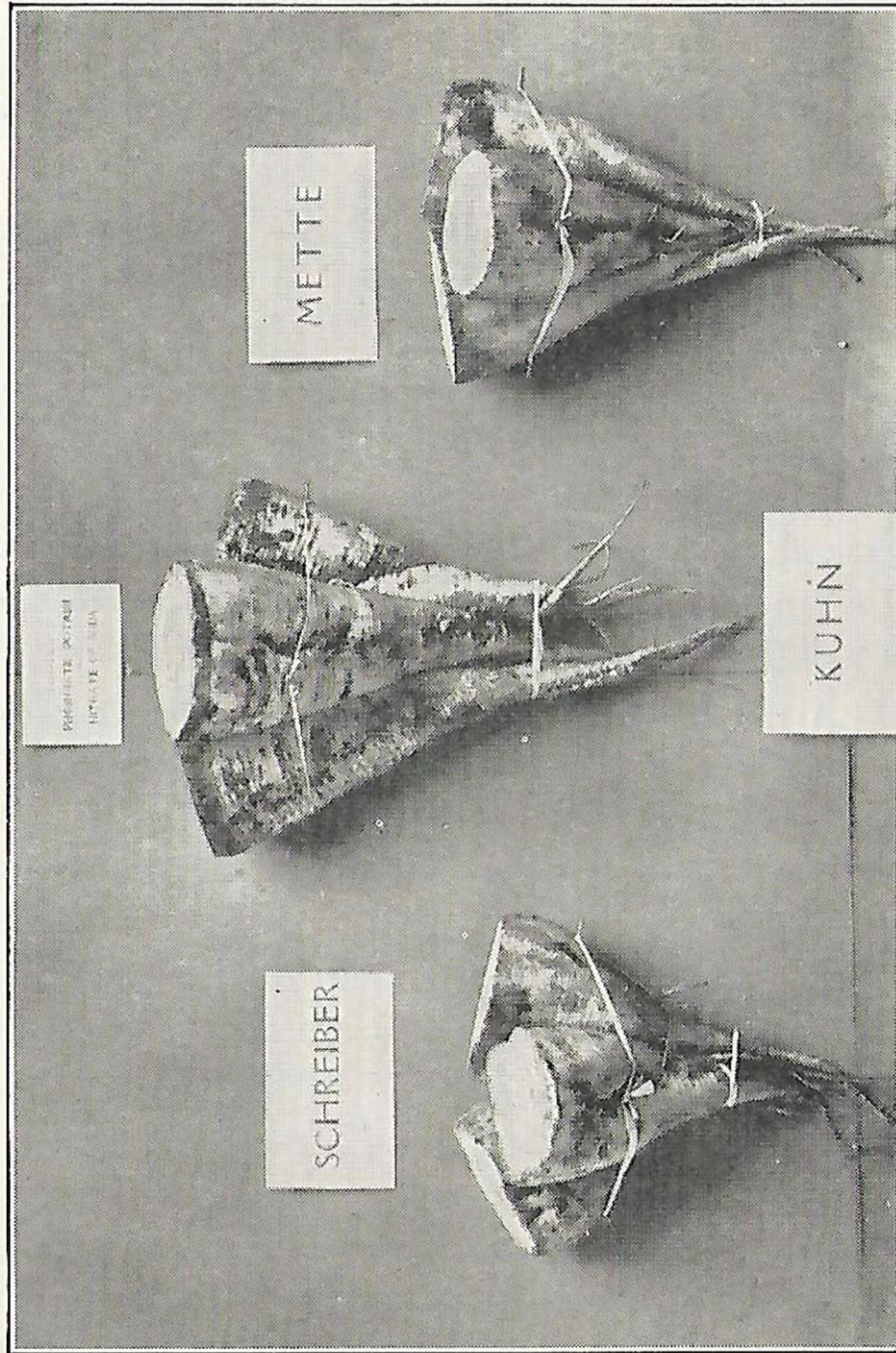
VARIETIES OF SUGAR BEET.

Manured with Nitrate of Soda, Phosphates and Potash.



VARIETIES OF SUGAR BEET.

Manured with Nitrate of Soda, Phosphates and Potash.



Within certain limits, it is the number of sugar beet per square yard or per acre which determines the yield per acre. It is therefore very important that the drills should be as close as possible, and it is necessary to have a drill and horse hoe suitable for the work.

In England a distance of 16 to 22 inches between the drills will usually be found most suitable.

The width that is proving satisfactory on medium soils is 18 inches. On heavy soils it is better to drill rather wider, say up to 22 inches.

An effort must be made by careful singling to secure an even "plant" in the rows 8 to 10 inches apart.

The roots of sugar beet on an average weigh $1\frac{1}{2}$ to 2 lbs. when topped; correct singling will mean many thousands of extra plants per acre and a proportional increase of crop in weight and sugar.

Assuming that the plants are the same distance apart in the drill rows, that is, about 9 inches, then 18 inch drills will have 38,900 plants per acre as against 29,000 for 24 inch drills, giving a balance of 11,900 roots in favour of 18 inch work.

The seed should not be buried deeper than a half to one inch. Many plant failures are due to the seed being drilled too deep.

The amount of seed will vary with the nature of the soil, but it is strongly advised that not less than 15 lbs. per acre be sown, while on heavier soils up to 20 lbs. per acre may be considered advisable. A heavy seeding is employed to ensure a regular plant under the most adverse conditions of weather and soil. Wherever the soil is inclined to crust after planting, the seed should be applied liberally, as a number of plants coming up together will lift the crust



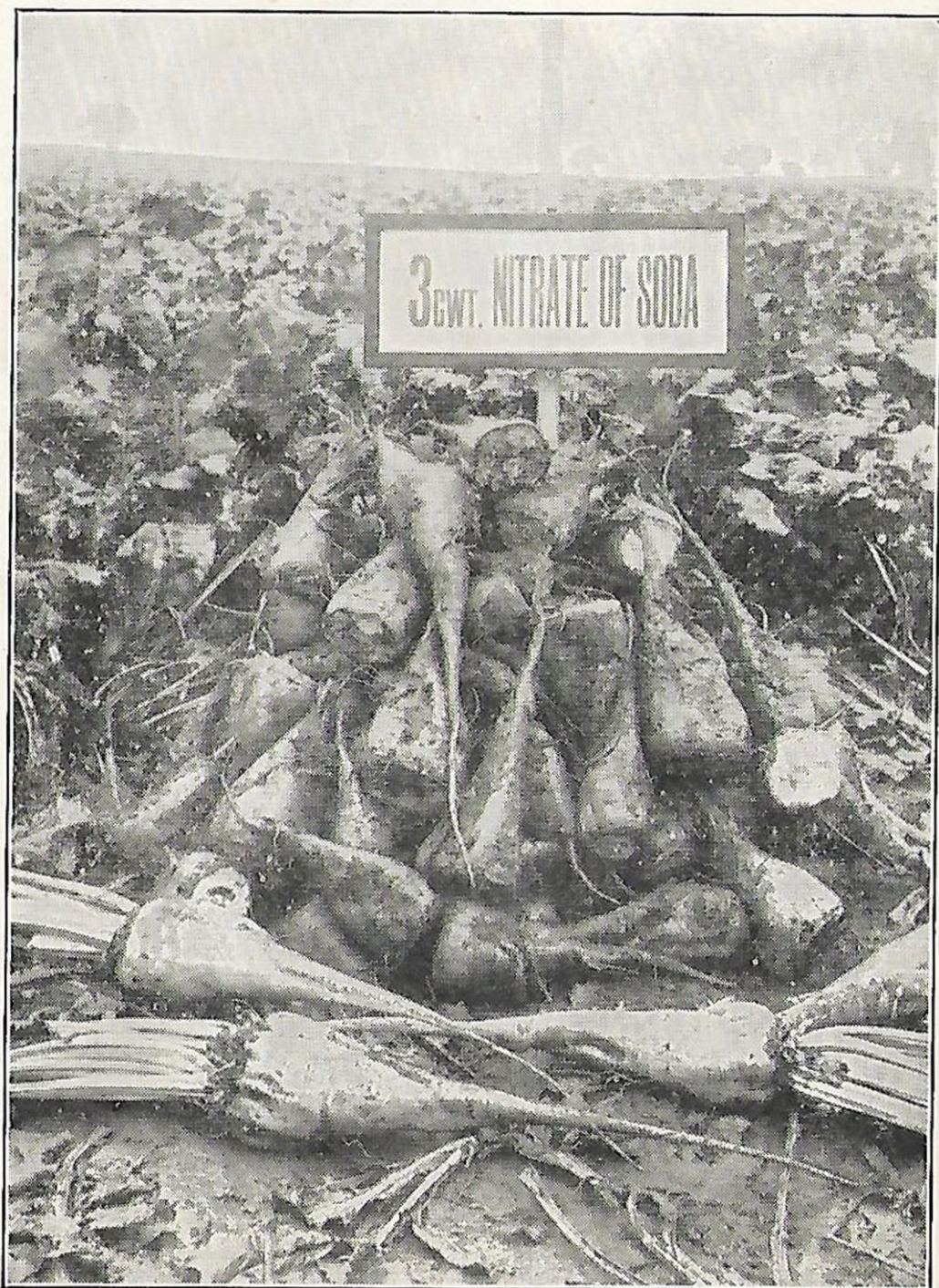
Ground *not* subsoiled.

Ground subsoiled.

EFFECT OF SUBSOILING.

Demonstration on Sugar Beet by H. HONE, Esq.,
Ingestone, Ross, Hereford.

Previous Crop—Oats. Soil—Heavy Loam on Clay.
Sub-Solled.



12 ton Dung, 6 cwt. Compound Fertiliser (West Midland Sugar Company) and
3 cwt. NITRATE OF SODA per acre.
Crop, 18 ton 9 cwt. Washed Beet and Weight of Sugar, 3 ton 4½ cwt. per acre.

where a thinner plant would be seriously delayed. A roller should follow the drill as a firm seed bed is necessary to ensure good germination of the seed and a full plant.

As careful and correct drilling is the foundation of a good crop, the grower should make a point of *personally* supervising this most important operation.

If the plant is not coming up evenly, the germination can usually be assisted by rolling, this will also help in keeping down mangold fly and other insect enemies—if the rolling is done early in the morning.

As a half plant will never produce a satisfactory crop, it is advisable to re-drill half plants, even as late as the end of May, arrangements being made with the factory to take delivery of such crops in the later months of the harvest.

Subsequent Treatment.

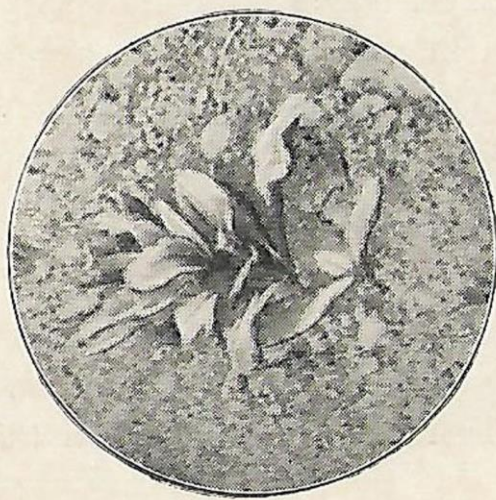
HOEING.—The continuous use of the hoe and the horse-hoe are absolutely essential for the successful cultivation of the sugar beet; they are necessary not only for the eradication of weeds, but also to allow the air to enter the soil and also to form a mulch on the surface which will retain the moisture rising from below. Hoeing should be begun immediately after the first young leaves appear and the rows become visible, and care must be taken not to cover the young plants with earth, although at a later stage the earth should be drawn towards the roots in order that they may be kept covered by soil, as uncovered roots lose sugar content.

It is essential that the land be kept clear from weeds right up to harvest time, and therefore hoeing should continue until the leaves of each row meet, and further work is impossible. It is obvious that beets drilled 16 inches

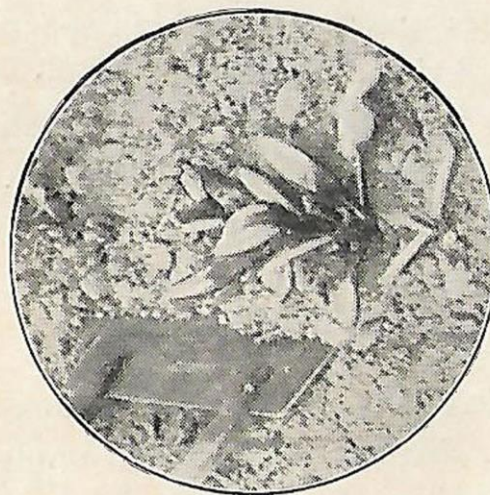
Bunching and Singling to "Cock" plant.



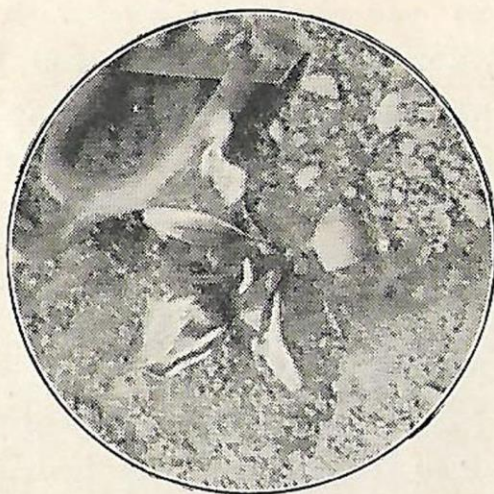
SINGLING OPERATIONS SHOWING "STAG" OR "COCK" BEET.



After bunching.



Striking out.



"Cock" beet left.

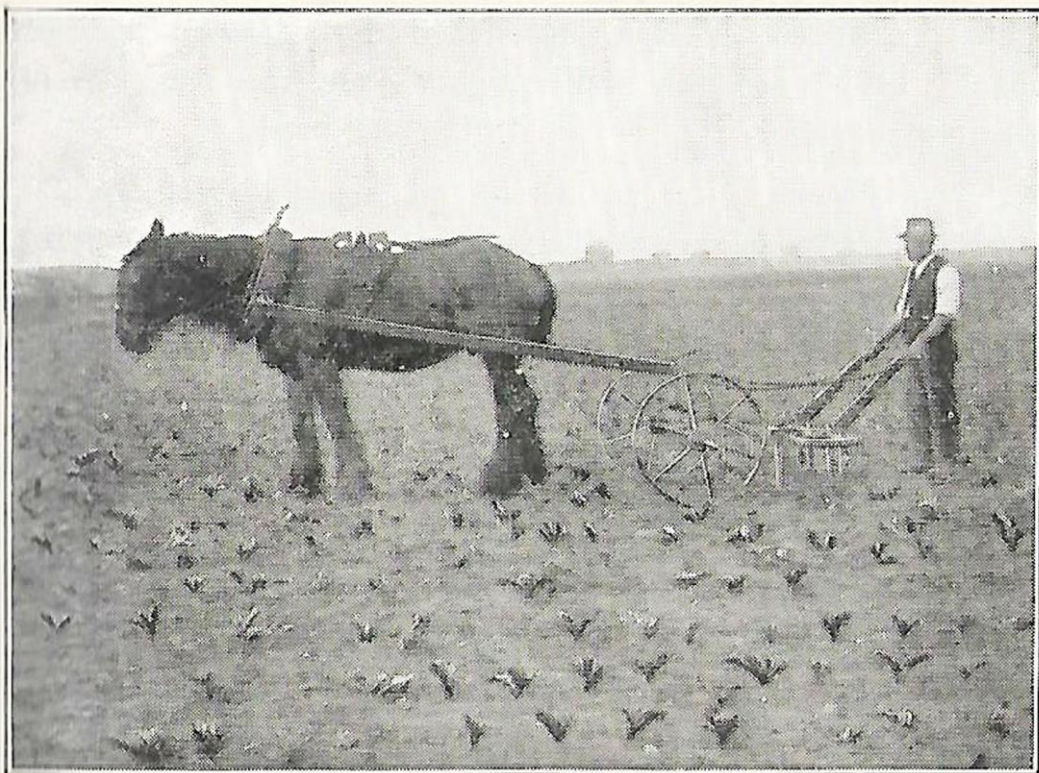
apart will meet and shut the furrow in much less time than where wider drills are employed, it follows then, that the narrower drills cannot be hoed so late as the wider ones, labour is thereby not only saved but set free at a time when the men are badly required for other urgent work on the farm.

SINGLING.—When the plants show four leaves they should be bunched and thinned out from 8 to 10 inches apart, according to the width of the drills, but on the black fen lands where beet are inclined to grow big or coarse, a higher sugar content will be obtained if the plants are singled 8 inches apart. If the singled plants are left too wide apart a serious reduction in the yield of the crop results. The operation of bunching should therefore be carefully watched, as experience has shown that the labourer tends to increase the distance between the bunches as he becomes tired in the latter part of the day. It is advisable to supply the hoers with 6-inch hoes.

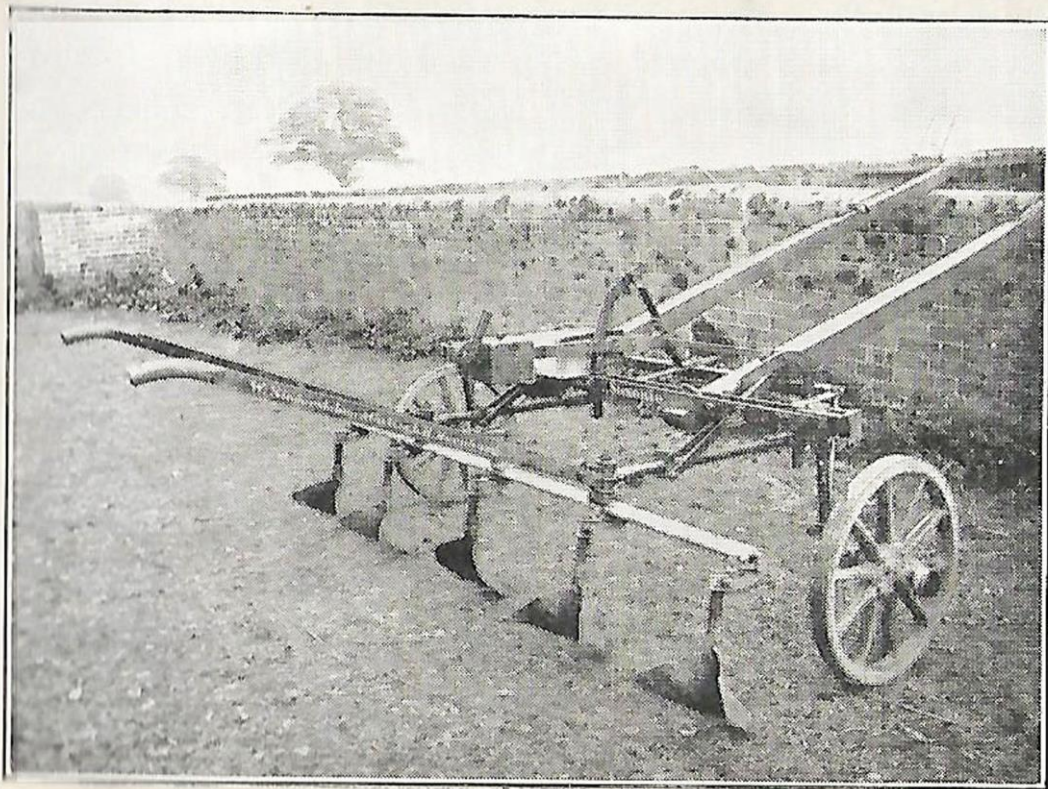
The cutting out should be followed as rapidly as possible by the singling, as it is most important to carry out the latter operation when the plants are small. It is very important that the cutting out and singling should be done carefully and as early as possible. Heavy yields, and, still less, beets rich in sugar, cannot be expected if singling is left too late. **The necessity of early singling cannot be too strongly urged.** It is estimated that at least 2 tons per acre are now lost in this country by the delay of this operation.

Beets singled by hand picking after the rows have been bunched by hoes ensures a full and healthy plant, and women or children can be employed on this operation with good results.

Three-row Horse-hoe at work.



Combined five-row Horse-hoe and Moulding-up Implement.



The yield per acre can be considerably increased if the hoers or pickers are instructed to leave the "stag" or "cock" beets, as these will quickly grow into big strong beets. (See page 29.)

The grower, if he wishes to get a good yield, should carefully organise his singling gangs and be constantly in attendance to see that the beet is being correctly and properly singled.

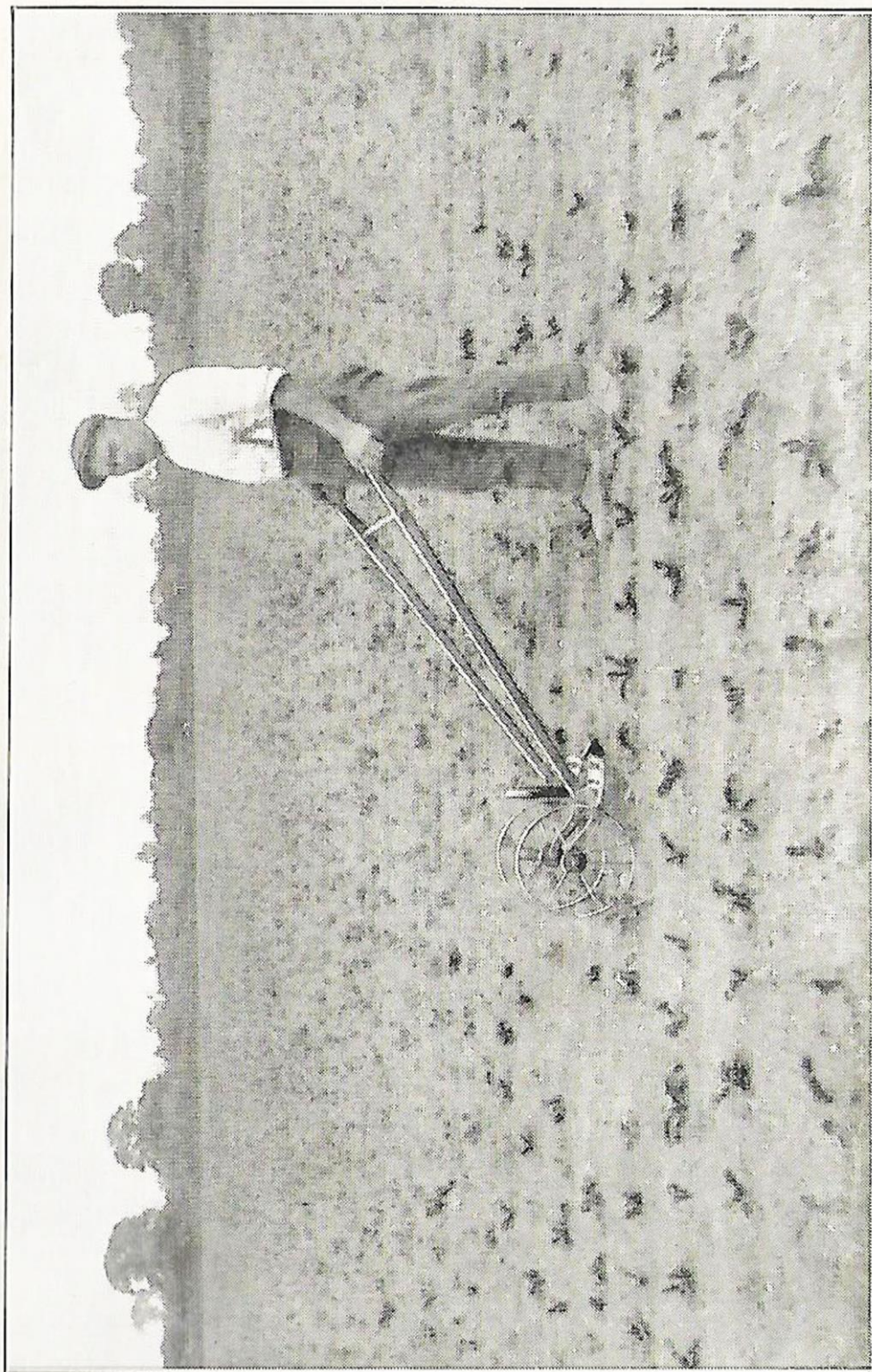
Growers are sometimes disappointed by the variation shown in the sugar contents of the roots, even when grown in the same field. This can occur not only from the difference in the soil, drainage, &c., but is certain to happen if any portions of the plant have been singled too late. Growers must realise this fact and not delay or the quality of the roots and the sugar contents will suffer.

Lifting or Harvesting the Crop.—Ripeness is indicated by the leaves becoming yellowish-green in colour, and drooping. About three-quarters of the foliage should have wilted, but the central leaves should still be fresh and green. An adjustable lifter is used to loosen the beets, which are pulled out by hand and topped squarely below the lowest leaves and thrown into heaps.

It is essential that topping be carefully carried out in order to avoid loss on delivery at the sugar factory due to bad topping. Special beet forks should be used to load them into carts. The heaps should be covered with the leaves to avoid loss of sugar by the action of frost or sun. The beet should be delivered as free from dirt as possible.

Loading and Transport of Roots to Factories.—The heavy loading of roots at all stations during the months of October November and December, is a matter

Planet Junior at work.



that must be reckoned with, not only by the railway company but by the grower. There are certain to be delays owing to the weather, and the clearing of the trucks at the factory. This can be eased considerably if growers will continue to lift roots whether they can load or not. If trucks are not available, the grower should continue to raise the roots, cart them off the land, and have them at a convenient spot for loading ; this will obviate the risk of delay in loading when weather conditions are unfavourable for lifting. It is acknowledged that one day's lifting roots in the latter part of October is well worth three days in December. Further, the land will be cleared, and the cultivations for next season's crop will not be delayed or interfered with.

BY-PRODUCTS OF THE SUGAR BEET CROP.

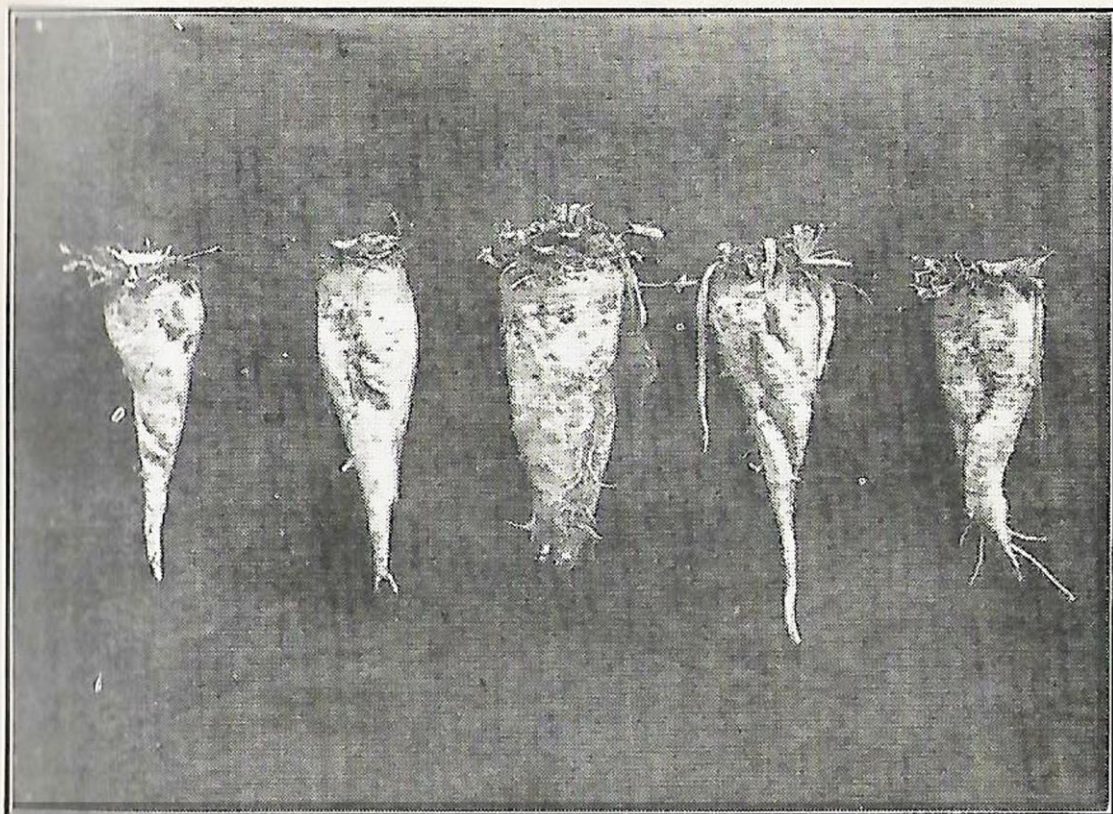
These consist of (1) tops and leaves ; (2) slices or pulp.

The tops and leaves remain in the field, being separated from the roots before the latter are delivered to the factory. They are valuable either as a feeding stuff or as a manure.

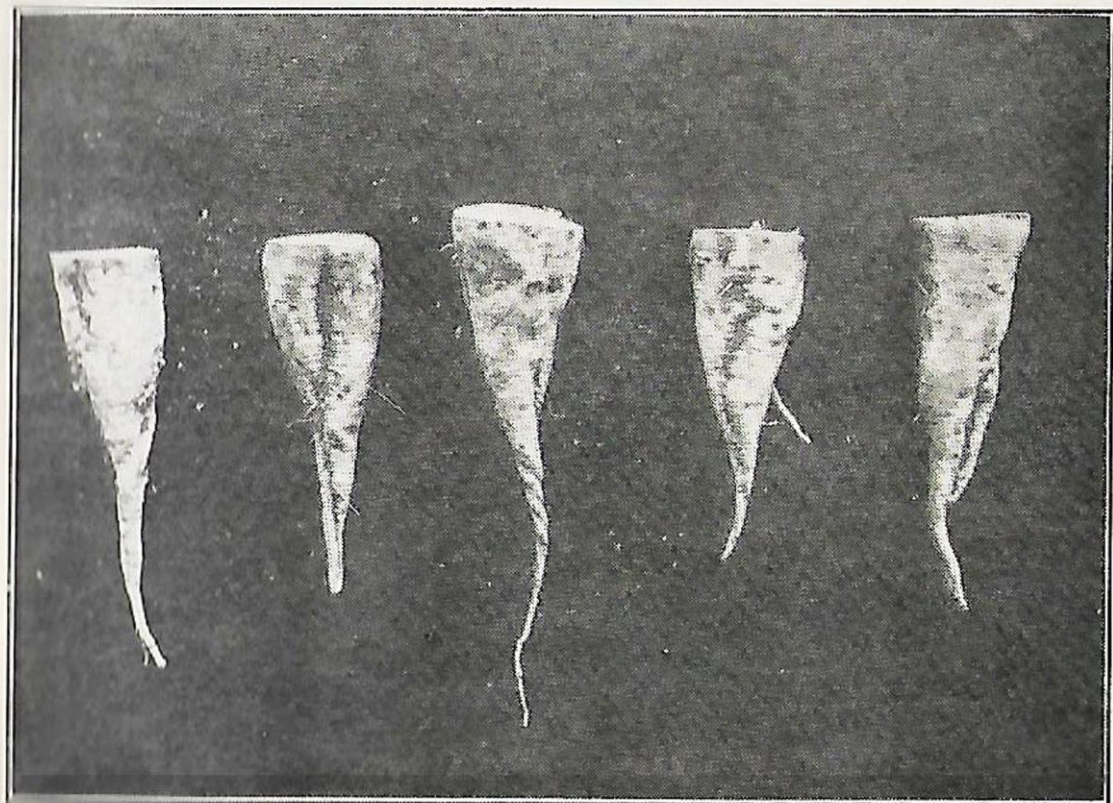
How to use the Tops.—The tops and leaves retained in the field are equal to about 75 per cent. of the weight of the beets delivered to the factory, and are estimated to be worth an equivalent acreage of white turnips.

As a green manure the tops possess considerable manurial value if ploughed in, for they provide a large store of humus, as well as fertilising ingredients.

They are, however, of greater value as food and can be fed direct off the land by cattle, sheep or pigs—the most economical method. The sheep or pigs can be penned on the fresh tops as the beet are lifted. The use of tops for

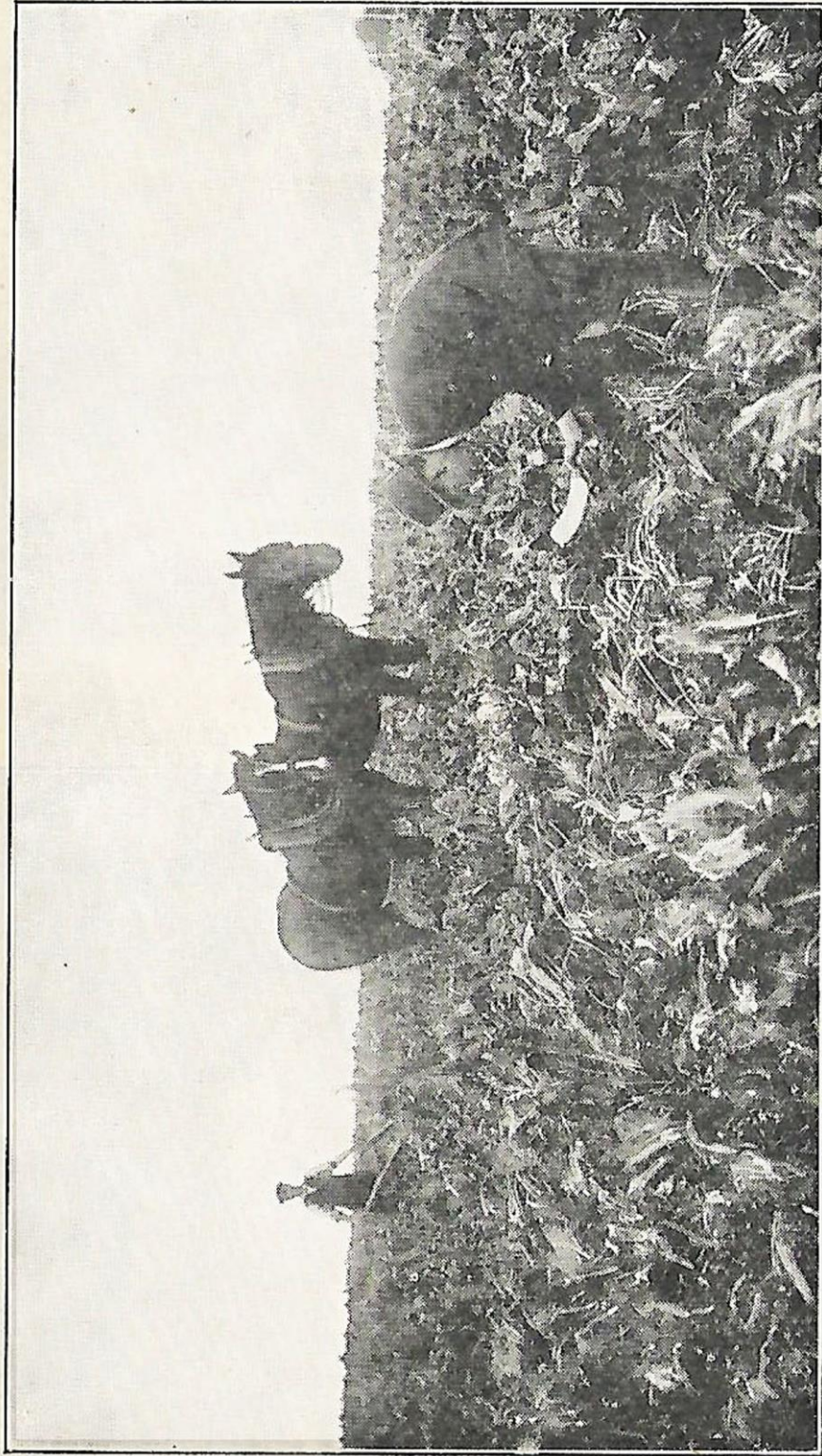


BADLY TOPPED ROOTS.



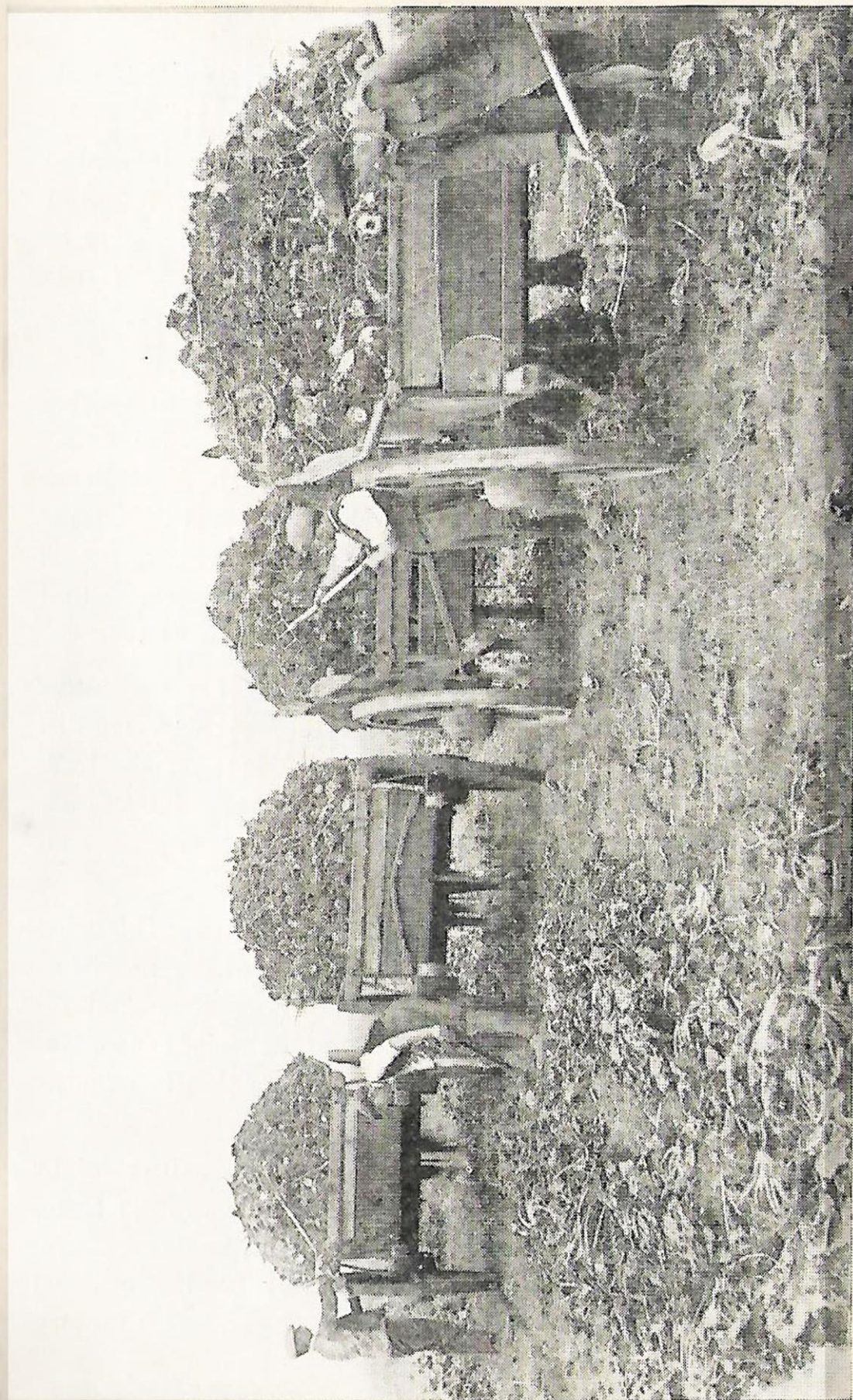
CORRECTLY TOPPED ROOTS.

Lifting, Pulling and Topping a Good Crop of Sugar Beet on the farm of R. PARRY, Esq.,
Gwynfryn, Pwllheli, North Wales.



Manured with 3 cwt. NITRATE OF SODA, 4 cwt. Superphosphate and 4 cwt. Kainit per acre.
Crop, 13 ton 18 cwt. Washed Beet and 17 per cent. Sugar.

Cash received from Factory £40. 4s. 11d. per acre.



CARTING SUGAR BEET.

feeding is strongly recommended from an economic standpoint.

They can be converted into silage or the newly separated tops may be gathered in heaps after being shaken free of soil, and covered with earth, or placed between layers of straw. The addition of salt at the rate of 7 lbs. per ton is an excellent preservative when the tops are stored in this manner.

Sugar beet leaves possess about half the feeding value of the roots and are inclined to be laxative. Animals should therefore be carefully fed with them with the addition of plenty of dry fodder and hay or even straw. Leaves and tops, as well as slices, should never be fed frozen as they will immediately lower the milk yield. Cows and heifers near calving should not be fed with the leaves.

The SLICES OR PULP is the residue of sugar beet after the greater part of the sugar content has been extracted at the factory. The wet slices (pulp) which contain the bulk of vegetable and mineral matter of the original beet, are run through presses to extract any surplus water, and finally thoroughly dried.

When thus prepared for return to the grower the dried slices resemble light coloured tea leaves, and are nearly as light in weight. One pound of dried slices, if soaked for 12 hours in two or three times the bulk (not weight) of water will be brought back to the condition in which it left the diffusion batteries at the factory.

Farmers occasionally take the slices as wet pulp straight from the factory; it is not so easy to handle in this form, nor will it keep indefinitely, as is the case in the dried state. One ton of beets will give approximately 100 lbs. of dried slices, which will contain 2 to 3 lbs. of sugar, as no factory is able to extract all the sugar from the slices.

Demonstration on Sugar Beet by D. W. EARDLEY, Esq., Greensforge, Kingswinford, Staffs.
Previous Crop—Turnips, unmanured.

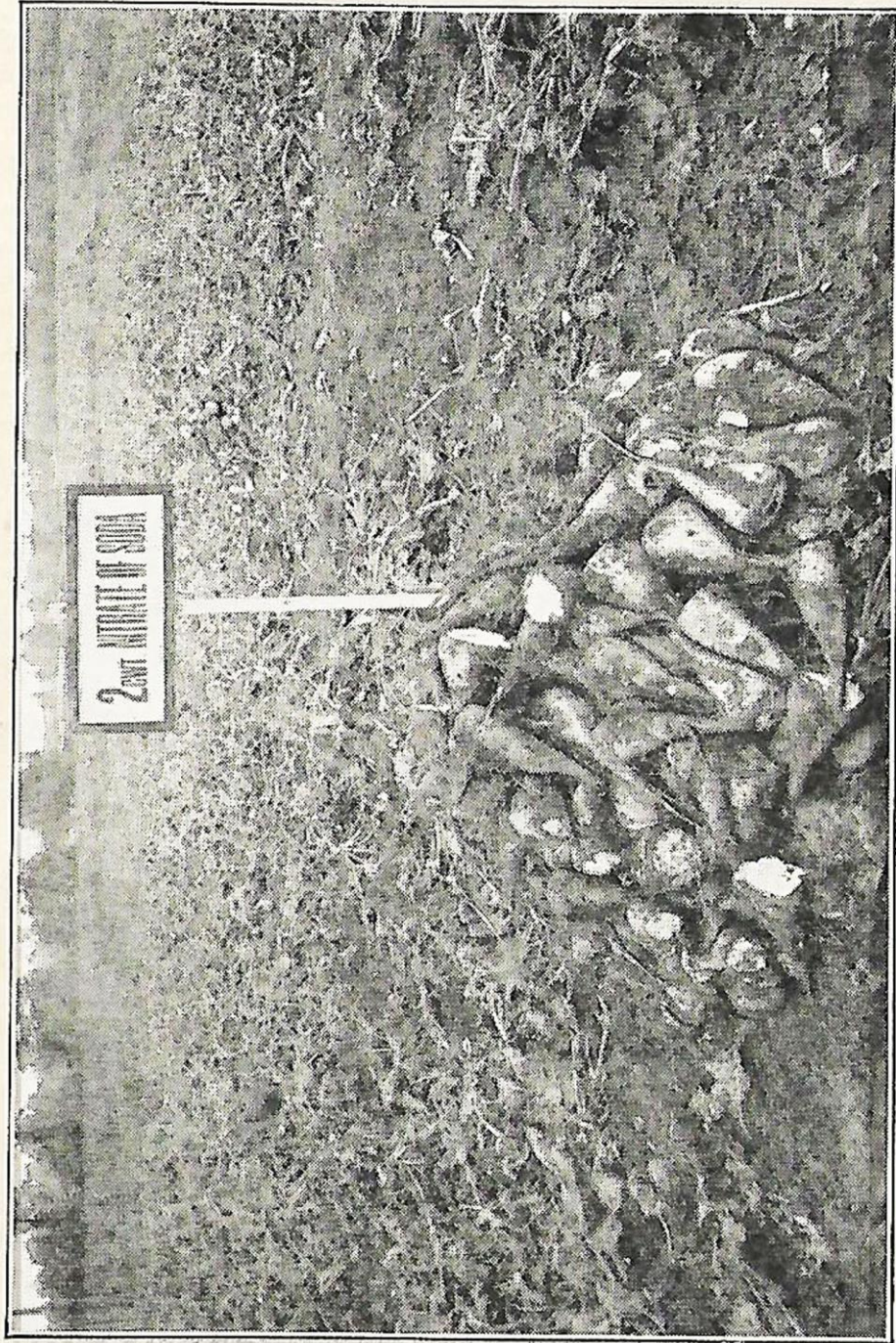


4 cwt. Super., 2 cwt. Muriate of Potash.
Crop, 11 ton 15 cwt. Washed Beet per acre.
Weight of Sugar, 1 ton 15½ cwt. per acre.

4 cwt. Super., 2 cwt. Muriate of Potash, 3 cwt. NITRATE OF SODA.
Crop, 15 ton 8¾ cwt. Washed Beet per acre.
Weight of Sugar, 2 tons 9½ cwt. per acre.

Net Gain due to the use of 3 cwt. of Nitrate of Soda £8. 12s. 9d. per acre.

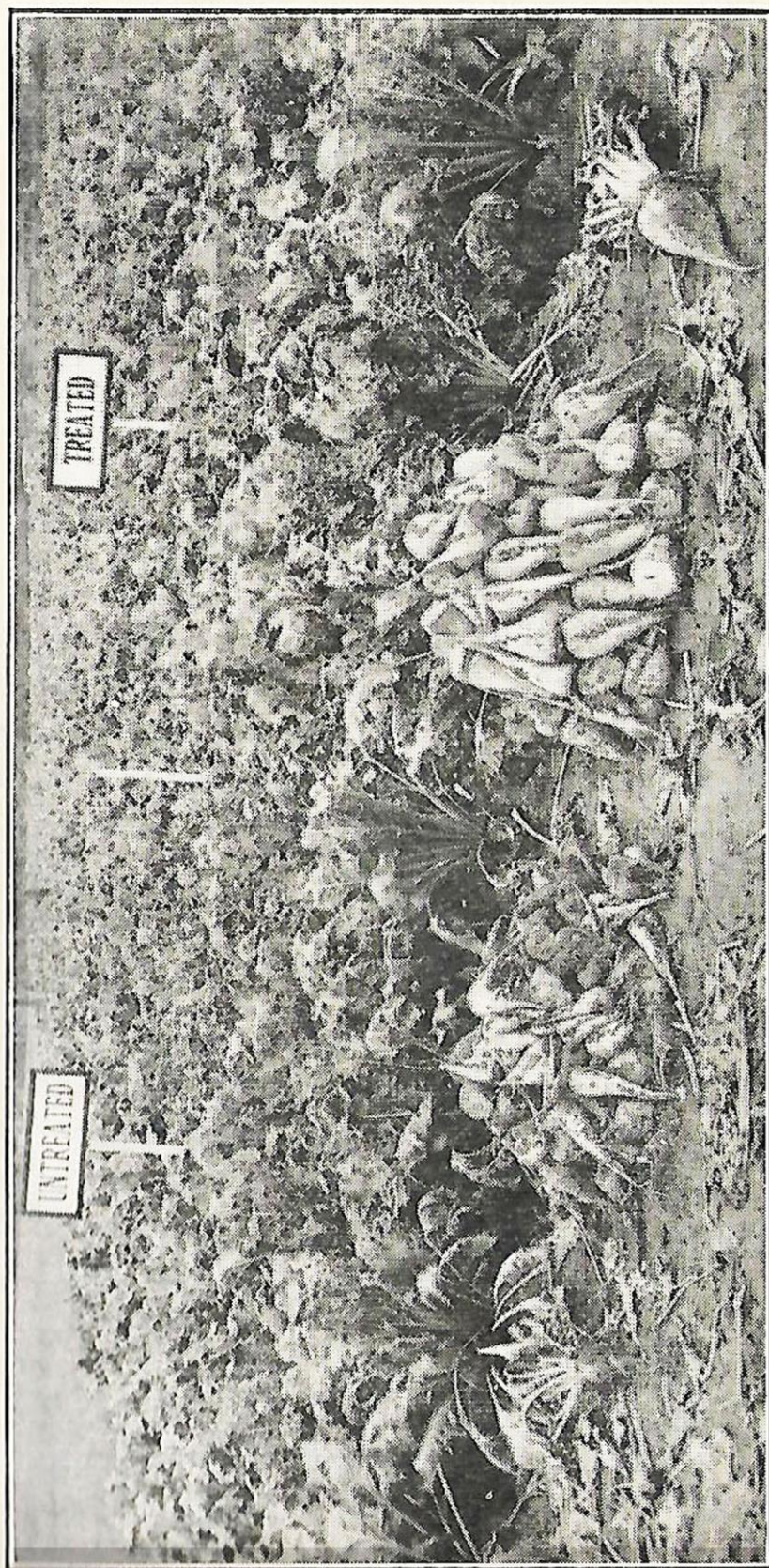
Official Trials by THE WORCESTERSHIRE COUNTY COUNCIL AGRICULTURAL DEPARTMENT
at Perdiswell Experimental Station, near Worcester.—1925-1926.



Nitrate of Soda has given the best financial return and Sugar content (Average of 2 years).

Demonstration on Sugar Beet by R. J. CORDINGLEY, Esq., Muckleton Hall, Wellington, Salop.

Previous Crop—Mangolds, manured with Dung, Lime, Phosphates, Potash, &c.



4 cwt. Super., 4 cwt. Kainit.
Crop, 7 ton 14½ cwt. Washed Beet per acre.
Weight of Sugar, 1 ton 6¼ cwt. per acre.

4 cwt. Super., 4 cwt. Kainit, 4 cwt. NITRATE OF SODA.
Crop, 14 ton 9¾ cwt. Washed Beet per acre.
Weight of Sugar, 2 ton 12¾ cwt. per acre.

Net Gain due to use of 4 cwt. Nitrate of Soda £17. 7s. 10d. per acre.

In every 100 lbs. of dried beet slices there are :—

8.9	per cent.	crude protein.
59.6	„	carbohydrates (including sugar).
18.6	„	fibre.
3.5	„	ash.
0.9	„	fats.
8.5	„	water.

100.0 lbs. Food units 84.

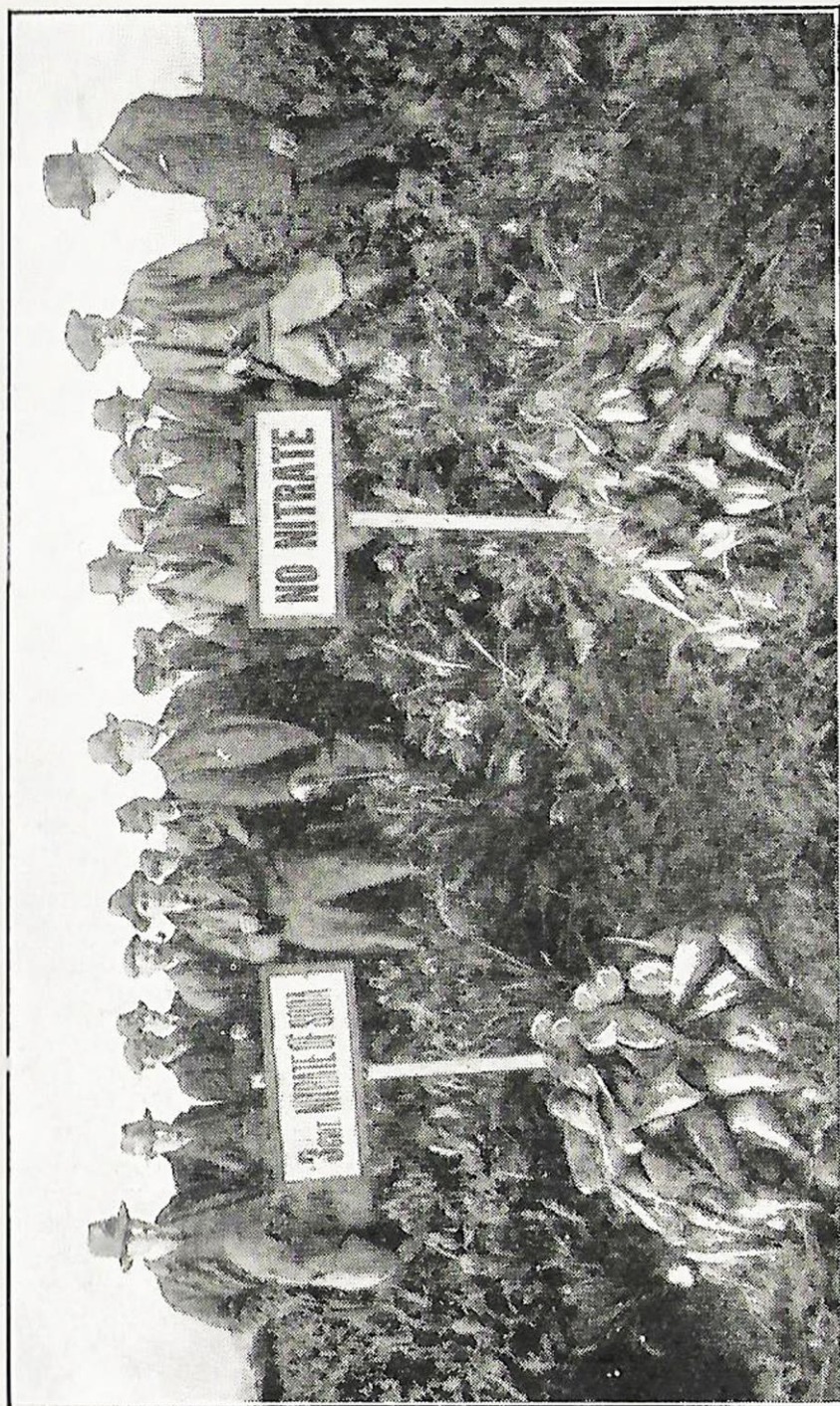
(*Henry & Morrison in "Feeds and Feeding."*)

The food units of dried grains are 108; of maize 109; of linseed cake 134.

Beet slices are very digestible. Though they contain almost 20 per cent. of crude fibre, 84 per cent. of this is digestible and there is less indigestible matter in them than in bran. They are also highly palatable, and it is universally admitted in all beet growing countries that cows never have to be coaxed to eat beet slices.

Beet slices are particularly valuable to dairymen in towns and others who usually purchase roots from a distance to feed their stock. By substituting beet slices for roots there is a great saving in weight, and, therefore, of railway carriage. Beet slices are excellent for growing cattle, sheep and pigs, as well as dairy cows and fattening cattle, and when British farmers realise the great value of this by-product of sugar beet cultivation, they will use it freely and to the best advantage. Thus, by growing sugar beet, not only will the country be more independent for its sugar supply, but there will also be the food available to support a larger head of stock on the farms than is customary at present.

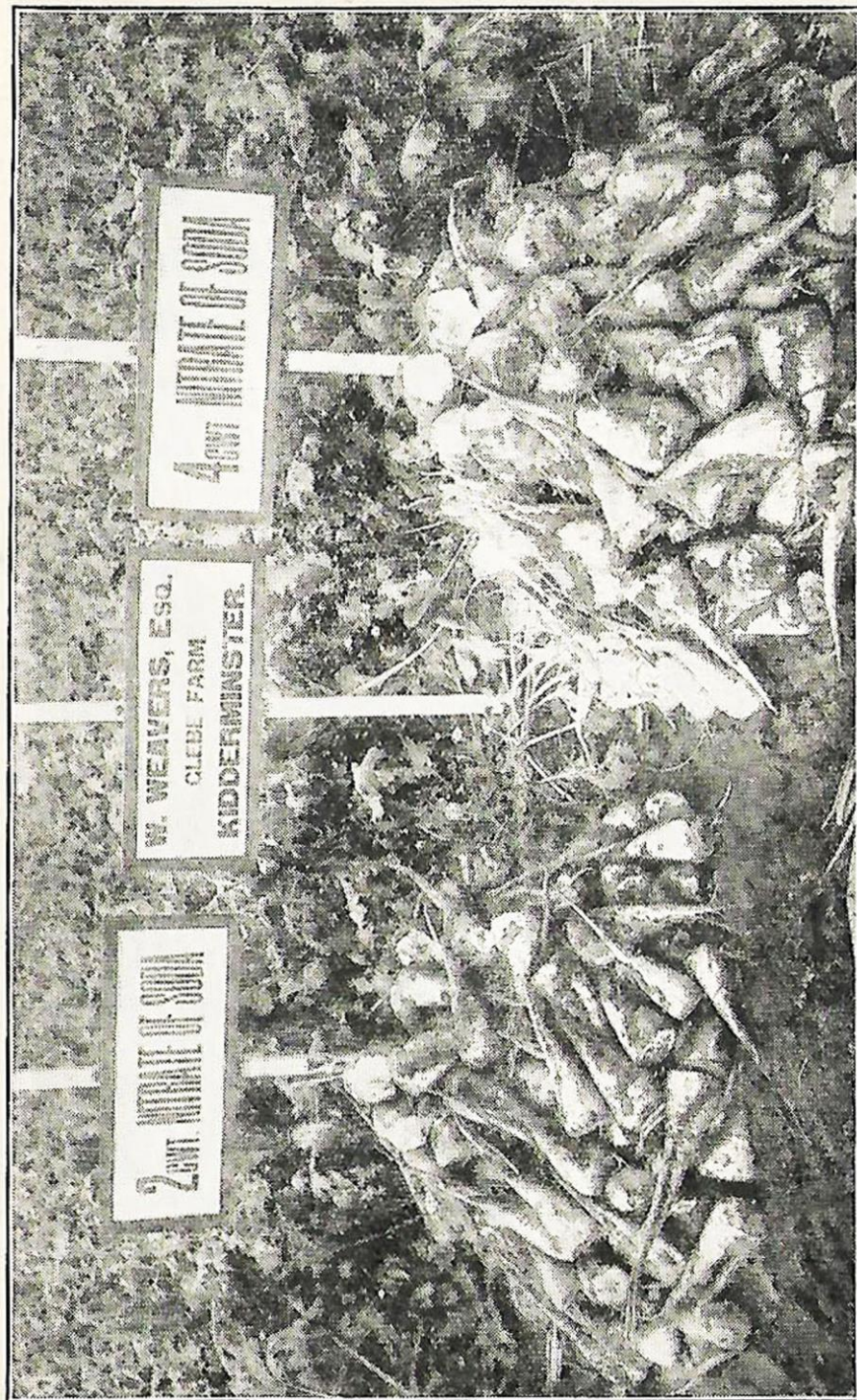
Official Trials by the CARNARVONSHIRE AGRICULTURAL EDUCATION COMMITTEE
on the farm of R. PARRY, Esq., Gwynfryn, Pwllheli, North Wales.



4 cwt. Super., 4 cwt. Kainit and 3 cwt. NITRATE OF SODA. 4 cwt. Super. and 4 cwt. Kainit.
Crop, 17 ton 10 cwt. Washed Beet. Crop, 12 ton 17½ cwt. Washed Beet.
Weight of Sugar, 3 ton 3¾ cwt. per acre. Weight of Sugar, 2 ton 4 cwt. per acre.
Net Gain due to the use of 3 cwt. Nitrate of Soda £13. 11s. 6d. per acre.

Demonstration on Sugar Beet by W. WEAVERS, Esq., The Glebe, Kidderminster,
Worcestershire.

Previous Crop—Turnips, manured with Lime, Shoddy, Super. and Kainit. Soil—Sandy Loam.



Crop, 13 ton 18 cwt. Washed Beet.

Weight of Sugar, 2 ton 9½ cwt. per acre.

Net Gain due to the use of 4 cwt. Nitrate of Soda £16. 2s. 4d. per acre.

Crop, 16 ton 12½ cwt. Washed Beet.

Weight of Sugar, 3 ton 1¼ cwt. per acre.

Showing effect on succeeding crop grown by W. BEECROFT, Esq., Clifton, Notts.

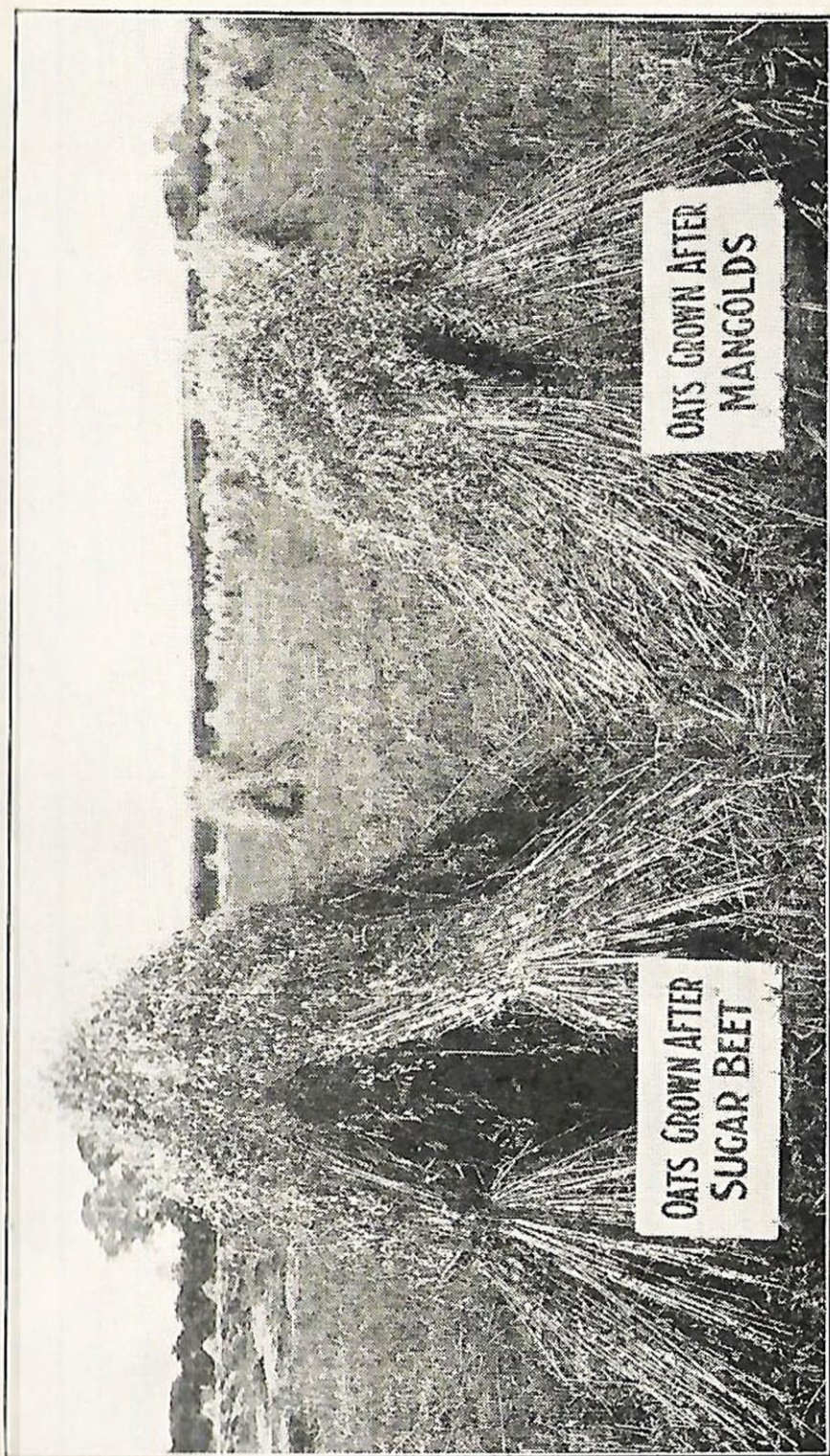


Photo by Spencer, Higson & Co., Shakespear Street, Nottingham.]

SUGAR BEET, 1928—Buckinghamshire.

Grown by Mr. W. E. Palmer, Manor Farm, Haddenham.

Previous Crop—Barley. Soil—Heavy Loam.

Plot.	Manures applied per acre.	Yield of Washed Beet per acre.			Percentage of Sugar.	Pounds of Sugar per acre.	Value of Crop per acre.			Cost of Manures.	Net Return per acre.		
		T.	c.	qr.			£	s.	d.	£	s.	d.	
1	(Dung, 15 tons Super., 3 cwt. Kainit, 3 cwt.)	10	3	1	17.5	3,984	26	3	4	1	4	0	24 19 4
2	As Plot 1 With Nitrate of Soda, at Seed time, 2 cwt. ...	12	3	3	17.7	4,832	31	13	10	2	8	0	29 5 10
3	As Plot 2 With addition of Nitrate of Soda, 1 cwt., at Singling ...	13	15	1	18.1	5,580	36	12	10	3	0	0	33 12 10

Official
Factory
Weights,
Analysis
and
Valuation.

Net Gain due to use of 2 cwt. Chilean Nitrate of Soda £4. 6s. 6d. per acre.

" " " " " £8. 13s. 6d. "

SUGAR BEET, 1928—Gloucestershire.

Grown by Mr. H. P. Hinds, Walden Court, Newent.

Previous Crop—Potatoes. Soil—Light Sandy.

Plot.	Manures applied per acre.	Yield of Washed Beet per acre.	Percentage of Sugar.	Pounds of Sugar per acre.	Value of Crop per acre.	Cost of Manures.	Net Return per acre.
		T. c. qr.			£ s. d.	£ s. d.	£ s. d.
1	Sugar Beet, Fertiliser, 8 cwt. ...	10 0 0	18.2	4,077	27 1 8	2 12 0	24 9 8
2	As Plot 1 Top-dressed with Nitrate of Soda, 2 cwt. ...	12 0 0	17.1	4,596	30 6 0	3 18 0	26 8 0
3	As Plot 1 Top-dressed with Nitrate of Soda, 3 cwt. ...	16 0 0	17.6	6,308	41 14 8	4 11 0	37 3 8

Official
Factory
Weights,
Analysis
and
Valuation.

Net Gain due to use of 2 cwt. Chilean Nitrate of Soda £1. 18s. 4d. per acre.

“ “ “ “ “ “ £12. 14s. 0d. “

SUGAR BEET, 1928—Nottinghamshire.

Grown by Messrs. Plowright, Hudson & Reynolds, Barton-in-Fabis.

Previous Crop—Oats.

Soil—Light Loam.

Plot.	Manures applied per acre.	Yield of Washed Beet per acre.			Percentage of Sugar.	Pounds of Sugar per acre.	Value of Crop per acre.			Cost of Manures.	Net Return per acre.			Official Factory Weights, Analysis and Valuation.		
		T.	c.	qr.			£	s.	d.	£	s.	d.	£		s.	d.
1	{ Dung, 20 loads Compound Manure, 6 cwt. ... }	9	6	0	17·6	3,666	24	9	9	6	0	0	18		9	9
2	As Plot 1 Top-dressed with Nitrate of Soda, 1½ cwt.	11	10	0	17·7	4,560	30	9	6	6	18	0	23		11	6

Net Gain due to use of Chilean Nitrate of Soda £5. 1s. 9d. per acre.

SUGAR BEET, 1928—Oxfordshire.

Grown by Mr. F. J. Adams, Byfield, Banbury.

Previous Crop—Wheat.

Soil—Medium Loam.

Plot.	Manures applied per acre.	Yield of Washed Beet per acre.	Percentage of Sugar.	Pounds of Sugar per acre.	Value of Crop per acre.	Cost of Manures.	Net Return per acre.	Official Factory Weights, Analysis and Valuation.
1	{ Dung, 12 ton Compound Manure, 5 cwt. ... }	T. c. qr. 10 0 0	16.6	3,718	£ s. d. 24 7 6	£ s. d. 2 3 9	£ s. d. 22 3 9	
2	As Plot 1 With Nitrate of Soda, 3 cwt., half at seed time, half at singling	13 8 2	16.9	5,083	33 4 8	4 2 9	29 1 11	
3	As Plot 1 With Nitrate of Soda, 4 cwt., half at seed time, half at singling	14 8 2	18.2	5,882	39 1 6	4 15 9	34 5 9	

Net Gain due to use of 3 cwt. Chilean Nitrate of Soda £6. 18s. 2d. per acre.

" " " " " £12. 2s. 0d. "

SUGAR BEET, 1928—Yorkshire.

Official Trials by Yorks Council for Agricultural Education on the farm of Mr. J. P. Roberts, Fairburn, Ferrybridge.

Previous Crop - Wheat. Soil—Strong Limestone.

Plot.	Manures applied per acre.	Yield of Washed Beet per acre.	Percentage of Sugar.	Pounds of Sugar per acre.	Value of Crop per acre.	Cost of Manures.	Net Return per acre.	Official Factory Weights, Analysis and Valuation.
		T. c. qr.			£ s. d.	£ s. d.	£ s. d.	
1	(Dung, 15 tons Muriate of Potash, 2 cwt. Super. 14 per cent., 2 cwt. (Dissolved Bones, 5 cwt.)	7 3 1	15.9	2,551	16 18 6	2 15 6	14 3 0	
2	As Plot 1 Top-dressed with Nitrate of Soda, 1 cwt.	10 8 0	15.8	3,681	24 8 0	3 8 0	21 0 0	

Net Gain due to use of Chilean Nitrate of Soda £6. 17s. per acre.

For further results in England, Scotland and Wales for years 1926 and 1927 write for special pamphlet No. 12, "Results of Field Demonstrations on Sugar Beet," supplied gratis and post free by The Chilean Nitrate Committee, Friars House, New Broad Street, London, E.C.2.

The Chilean Nitrate Committee invite correspondence on all problems concerning the manuring of crops, and will freely and gladly furnish all possible information regarding manures generally and Chilean Nitrate of Soda in particular.

Please write to:—

England and Wales.

The Chilean Nitrate Committee,
Friars House,
New Broad Street,
London, E.C. 2.

Scotland.

The Chilean Nitrate Committee,
131, West Regent Street,
Glasgow, C. 2.

Ireland.

The Chilean Nitrate Committee,
25, Chichester Street,
Belfast.